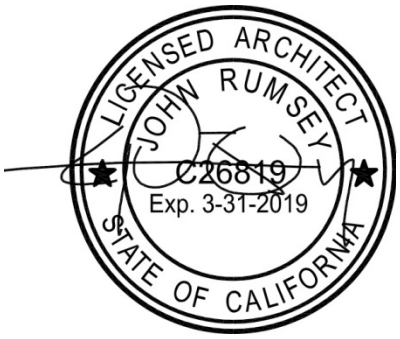
WINTERHAVEN PUBLIC SAFETY FACILITY PROJECT

Funded by:

California Department of Housing and Community Development (HCD) through its Community Development Block Grant (CDBG) Program and the County of Imperial.



Prepared by:

MPA Architects, Inc.

For:

Imperial County Community & Economic Development Department
940 West Main Street, Suite 203
El Centro, CA 92243
Point of Contact: Esperanza Colio
Office (442) 265-1100
Fax (442) 265-1118

PROJECT MANUAL
SEPTEMBER 19, 2017

VOLUME 4 OF 4
BUILDING TECHNICAL SPECIFICATIONS

VOLUME 4 – BUILDING TECHNICAL SPECIFICATIONS

SECTION 00 01 10 – TABLE OF CONTENTS

DIVISION 00	**CONTRACTING REQUIREMENTS**	**NUMBER OF PAGES**
REFER TO VOLUMES 1, 2 AND 3 FOR CONTRACTING REQUIREMENTS		
00 92 00	Architects General Conditions	2
00 93 00	Architects Supplemental Conditions	6
DIVISION 01	**GENERAL REQUIREMENTS**	
REFER TO VOLUMES 1, 2 AND 3 FOR ADDITIONAL GENERAL REQUIREMENTS		
01 40 00	Quality Control	4
DIVISION 02	**NOT USED**	
REFER TO VOLUME 3 FOR ADDITIONAL GENERAL REQUIREMENTS		
DIVISION 03	**CONCRETE**	
REFER TO VOLUME 3 FOR SITE RELATED WORK		
03 30 00	Concrete Work	6
DIVISION 04	**MASONRY**	
REFER TO VOLUME 3 FOR SITE RELATED WORK		
04 21 13.13	Adhered Masonry Veneer	2
DIVISION 05	**METALS**	
05 11 00	Structural Steel and Miscellaneous Metal Work	2
05 20 00	Steel Joists	2
05 30 00	Metal Decking	2
05 40 00	Light Gage Metal Framing	4
DIVISION 06	**WOOD, PLASTICS, AND COMPOSITES**	
06 10 00	Rough Carpentry	4
06 20 00	Finished Carpentry and Millwork	4

DIVISION 07	**THERMAL & MOISTURE PROTECTION**	**NUMBER OF PAGES**
07 20 00	Building Insulation	2
07 25 00	Weather Barriers	4
07 32 19	Metal Roofing	4
07 45 56	Fiber Cement Siding	6
07 51 01	Roof Guarantee and Maintenance Agreement	2
07 54 23	Thermoplastic Polyolefin (TPO) Roofing System	16
07 60 00	Flashing and Sheet Metal	4
07 84 00	Firestopping	2
07 90 00	Joint Sealers	4
DIVISION 08	**OPENINGS**	
08 11 00	Steel Doors and Frames	2
08 14 00	Wood Doors	2
08 36 00	Sectional Overhead Doors	6
08 41 00	Aluminum Entrances and Storefronts	4
08 43 00	Aluminum Storefronts	4
08 53 13	Vinyl Windows	6
08 71 00	Hardware	8
08 81 00	Glass and Glazing	2
DIVISION 09	**FINISHES**	
09 21 00	Architectural Pre-Coated EPS Foam Shapes	6
09 24 00	Lath and Plaster	4
09 29 00	Gypsum Drywall	6
09 29 01	Drywall Penetration Barrier	4
09 30 00	Tile	2
09 30 50	Tile Setting Materials and Accessories	4
09 51 00	Acoustical Ceilings	4
09 65 00	Resilient Tile Flooring	4
09 91 00	Painting	4
09 96 00	Water Repellent Wall Coatings	4
DIVISION 10	**SPECIALTIES**	
10 21 13	Toilet Compartments	2
10 28 13	Restroom Accessories	2
10 28 13.13	Multiple Accommodation Toilet Room Accessories	2
10 44 13	Fire Extinguisher Cabinets	4
10 44 16	Fire Extinguishers	4
10 51 13	Metal Lockers	14

DIVISION 11	**EQUIPMENT**	**NUMBER OF PAGES**
11 31 00	Appliances	6
DIVISION 12	**FURNISHINGS**	
12 35 30	Casework	4
12 36 61	Simulated Stone Countertops	4
12 93 00	Miscellaneous Site work Items	2
DIVISION 13	**SPECIAL CONSTRUCTION**	
13 34 19	Metal Building Systems	~~22~~ 16
DIVISION 14 THRU 20		**NOT USED**
DIVISION 21	**FIRE SUPPRESSION**	
21 05 48	Vibration & Seismic Controls for Fire-Suppression Piping and Equipment	6
21 11 00	Facility Fire-Suppression Water-Service Piping	22
21 12 00	Fire Suppression Standpipes	14
21 13 13	Wet-Pipe Sprinkler Systems	22
DIVISION 22	**PLUMBING**	
22 00 00	Plumbing	8
DIVISION 23	**HEATING, VENTILATING, AND AIR CONDITIONING**	
23 00 00	Heating, Ventilating and Air Conditioning	2
DIVISION 24 THRU 25		**NOT USED**
DIVISION 26	**ELECTRICAL**	
26 00 00	Electrical	16
26 05 19	Low-Voltage Electrical Power Conductors and Cables	6
26 05 36	Cable Trays for Electrical Service	6
26 32 13	Engine Generator	14
26 32 23	Engine Generator Automatic Transfer Switch	12
26 99 99	Imperial County Structured Cabling / Communication Stds	6

DIVISION 27 **NOT USED**

DIVISION 28	**ELECTRONIC SAFETY & SECURITY**	**NUMBER OF PAGES**
28 05 00	Common Work Results for Electronic Safety & Security	4
28 05 13	Conductors and Cables for Electronic Safety & Security	18
28 31 11	Digital, Addressable Fire-Alarm System	16

DIVISION 29 THRU 33 **NOT USED**

END OF SECTION

SECTION 00 92 00 – ARCHITECT'S GENERAL CONDITIONS

Refer to 'AIA Document A201-2007: General Conditions of the Contract for Construction' for complete information of General Conditions. (AIA Document A201-2007 can be obtained from the local AIA offices).

END OF SECTION

(PAGE INTENTIONALLY LEFT BLANK)

SECTION 00 93 00 – ARCHITECT'S SUPPLEMENTARY CONDITIONS

The "General Conditions of the Contract for Construction", AIA Document A201-2007, Articles 1 through 14, inclusive, is part of the Contract Documents.

The following supplements modify the "General Conditions of the Contract for Construction" AIA Document A201-2007. Where a portion of the General Conditions is modified or deleted by these Supplementary Conditions, the unaltered portions of the General Conditions shall remain in effect. The General Conditions also may be supplemented elsewhere in the Contract Documents by provisions located in, but not necessarily limited to, Division 01 of the Specifications.

A. Portions of AIA Document A201-2007 supplemented herein:

1.1.8 Miscellaneous Definitions
1.5.2 Contractor's Use of Instruments of Service in Electronic Form
2.2.3 Information and Services Required of the Owner
2.2.6 Information and Services Required of the Owner
3.2.4 Review of Contract Documents and Field Conditions by Contractor
3.4.2 Labor and Materials
3.4.4 Labor and Materials
3.9.2 Superintendent
3.11.1 Documents and Samples at the Site
3.12.7 Shop Drawing, Product Data and Samples
3.12.8 Shop Drawing, Product Data and Samples
3.12.9 Shop Drawing, Product Data and Samples
3.12.10 Shop Drawing, Product Data and Samples
3.12.11 Shop Drawing, Product Data and Samples
3.15.1 Cleaning Up
4.2.2.1 Architect's Administration of the Contract
4.2.7 Architect's Administration of the Contract
6.2.4 Mutual Responsibility
7.2.1 Change Orders
7.3.1 Construction Change Directives
13.4.3 Rights and Remedies

ARTICLE 1: GENERAL PROVISIONS

1.1 BASIC DEFINITIONS

1.1.8 Add the following Subparagraph:

"1.1.8 Miscellaneous Definitions:
.1 The term "product" includes materials, systems, and equipment.
.2 The term "provide" includes furnishing and installing a product, complete in place, tested and approved.

.3 The term "building code", and the term "code", refer to regulations of governmental agencies having jurisdiction over the Work at time of permit.

.4 The terms "approved", "required", "as directed", and terms of similar import, refer to and indicate the Work or materials that may be approved, required, or directed by the Architect acting as the agent of the Owner.

.5 The term "similar" is used in its general sense but does not necessarily mean "identical."

.6 The terms "shown", "indicated", "detailed", "noted", "scheduled", and terms of similar import, refer to requirements contained in the Contract Documents.

.7 The term "equal" and terms of similar import, refers to a warranty by the Contractor that the type, kind and nature of any substituted product or material or the Work shall be equal to that specified in the Contract Documents and approved in writing by the Architect. The procedure for the Contractor to obtain Architect's approval for such substitutions is set forth in Section 01 60 00."

1.5 OWNERSHIP AND USE OF DRAWINGS, SPECIFICATIONS AND OTHER INSTRUMENTS OF SERVICE

1.5.2 Add the following Subparagraph 1.5.2 to Paragraph 1.5:

"1.5.2 Contractor's Use of Instruments of Service in Electronic Form.

.1 The Architect may, with the concurrence of the Owner, furnish to the Contractor versions of Instruments of Service in electronic form. The Contract Documents executed or identified in accordance with Subparagraph 1.5.1 shall prevail in case of an inconsistency with subsequent versions made through manipulatable electronic means involving computers.

.2 The Contractor shall not transfer or reuse Instruments of Service in electronic or machine readable form without the prior written consent of the Architect.

.3 The Instruments of Service in electronic form are without warranty as to their accuracy or suitability for the purpose of the Contractor's intended use.

.4 Any changes or modifications to the Instructions of Service in electronic form introduced by anyone other than the Architect may result in adverse consequences and the Contractor shall defend, indemnify and hold harmless the Owner, Architect and Architect's consultants against any adverse consequences."

ARTICLE 2: OWNER

2.2 INFORMATION AND SERVICES REQUIRED OF THE OWNER

2.2.3 Add the following sentence to the end of Subparagraph 2.2.3:

"The Owner shall furnish a preliminary Soils Investigation Report describing the subsurface characteristics of the soil along with recommended design and construction guidelines. The Contractor to follow recommendations and include within his scope of the Work."

2.2.6 Add the following Subparagraph 2.2.6 to paragraph 2.2:

"2.2.6 When the applicable building codes or regulations prohibit the Contractor to be responsible for structural tests or to employ special inspectors, the Owner will procure and bear costs of those structural tests and special inspections."

ARTICLE 3: CONTRACTOR

3.2 REVIEW OF CONTRACT DOCUMENTS

3.2.4 Add the following Subparagraph 3.2.4 to paragraph 3.2:

"3.2.4 Should conflict occur between the Contract Documents, the Contractor is deemed to have based his estimate upon the more expensive method of performing the Work unless he has requested and received a written decision from the Architect before submission of his proposal."

3.4 LABOR AND MATERIALS

3.4.2 Delete Subparagraph 3.4.2 and substitute the following:

"3.4.2 After the Contract has been executed, the Architect may, at the option of the Owner, consider a formal request for the substitution of products in place of those specified only under the conditions set forth in the General Requirements (Division 01 of the Specifications). By making requests for substitutions, the Contractor:

.1 represents that the Contractor has personally investigated the proposed substitute product and determined that it is equal or superior in all respects to that specified;

.2 represents that the Contractor will provide the same warranty for the substitution that the Contractor would for that specified;

.3 certifies that the cost data presented is complete and includes all related costs under this Contract except the Architect's review and redesign costs, and waives all claims for additional costs related to the substitution which subsequently become apparent; and

.4 will coordinate the installation of the accepted substitute, making such changes as may be required for the Work to be complete in all respects."

3.4.4 Add the following Subparagraph 3.4.4 to Paragraph 3.4:

"3.4.4 The Owner shall be entitled to deduct from the Contractor's Contract Sum amounts paid to the Architect to evaluate the Contractor's proposed substitutions and to make agreed-upon changes in the Drawings and Specifications made necessary by the Owner's option of such substitutions."

3.9 SUPERINTENDENT

3.9.2 Add the following Subparagraph 3.9.2 to Paragraph 3.9:

"3.9.2 The Contractor shall employ a superintendent or an assistant to the superintendent who will perform as a coordinator for all Work. The coordinator shall be knowledgeable in all systems and be capable of reading, interpreting and coordinating Drawings, Specifications and shop drawings pertaining to such systems. The coordinator shall assist the Subcontractors in arranging space conditions to eliminate interference between the systems and other Work and shall supervise the preparation of coordination drawings documenting the spatial arrangements for such systems within restricted spaces. The coordinator shall assist in planning and expediting the proper sequence of delivery of equipment to the site."

3.11 DOCUMENTS AND SAMPLES AT THE SITE

3.11.1 Modify Subparagraph 3.11.1 by substituting "reviewed" for "approved" in fourth line.

3.12 SHOP DRAWINGS, PRODUCT DATA AND SAMPLES

3.12.7 Modify Subparagraph 3.12.7 by substituting "reviewed" for "approved".

3.12.8 Modify Subparagraph 3.12.8 by substituting "review" for "approval" and "reviewed" for "approved".

3.12.9 Modify Subparagraph 3.12.9 by substituting "review" for "approval".

3.12.10 Delete the word "approve" in sixteenth line.

3.12.11 Add the following Subparagraph 3.12.11 to Paragraph 3.12:

"3.12.11 The Architect's review of Contractor's submittals will be limited to examination of an initial submittal and one (1) resubmittal. The Architect's review of additional submittals will be made only with the consent of the Owner after notification by the Architect. The Owner shall be entitled to deduct from the Contract Sum amounts paid to the Architect for evaluation of such additional resubmittals."

3.15 CLEANING UP

3.15.1 Add the following sentence to the end of Subparagraph 3.15.1:

"In addition, leave the building broom clean; clean all glass; replace any broken glass; remove stains, spots, marks and dirt from finish work; clean hardware; remove paint spots and smears from all surfaces; clean fixtures and wash all tile and concrete floors; use only the cleaning materials and equipment which are compatible with the surface being cleaned, as recommended by the manufacturer of the material being cleaned; remove all debris from roof, parking lot, planting areas, etc."

ARTICLE 4: ARCHITECT

4.2 ADMINISTRATION OF THE CONTRACT

4.2.2.1 Add the following Clause 4.2.2.1 to Subparagraph 4.2.2:

"4.2.2.1 The Contractor shall reimburse the Owner for compensation paid to the Architect for additional site visits made necessary by the fault, neglect or request of the Contractor."

4.2.7 Delete Subparagraph 4.2.7 and substitute the following:

"4.2.7 The Architect will review or take other appropriate action upon Contractor's submittals such as Shop Drawings, Product Data and Samples, but only for the limited purpose of checking for conformance with information given and the design concept expressed in the Contract Documents. The Architect's action will be taken with such reasonable promptness as to cause no delay in the Work or in the activities of the Owner, Contractor or separate Contractors, while allowing sufficient time in the Architect's professional judgment to permit adequate review. Review of such submittals is not conducted for the purpose of determining the accuracy and completeness of other details such as dimensions and quantities, or for substantiating instructions for installation or performance of equipment or systems, all of which remain the responsibility of the Contractor as required by the Contract Documents. The Architect's review of the Contractor's submittals shall not relieve the Contractor of the obligations under Paragraphs 3.3, 3.5 and 3.12. The Architect's review shall not constitute acceptance of safety precautions or, unless otherwise

specifically stated by the Architect, of any construction means, methods, techniques, sequences or procedures. The Architect's review of a specific item shall not indicate acceptance of an assembly of which the item is a component. The Contractor shall be responsible for all dimensions, which shall be confirmed and correlated at the job site, and for all information which pertains to the fabrication processes or to techniques of construction and for coordination of the Work of all trades. Shop Drawings shall clearly note all deviations from the Contract Documents."

ARTICLE 6: CONSTRUCTION BY OWNER OR BY SEPARATE CONTRACTORS

6.2 MUTUAL RESPONSIBILITY

6.2.4 Delete the word "wrongfully" in the first line of Subparagraph 6.2.4.

ARTICLE 7: CHANGES IN THE WORK

7.2 CHANGE ORDERS

7.2.1 Modify the first line of Subparagraph 7.2.1 to read: "A Change Order is a written instrument prepared by the Contractor and signed by the…"

7.3 CONSTRUCTION CHANGE DIRECTIVES

7.3.1 Modify the first line of Subparagraph 7.3.1 to read: "A Construction Change Directive is a written order prepared by the Contractor and signed…"

ARTICLE 13: MISCELLANEOUS PROVISIONS

13.4 RIGHTS AND REMEDIES

13.4.3 Add the following Subparagraph 13.4.3 to Paragraph 13.4:

"13.4.3 The invalidity of any part or provision of the Contract Documents shall not impair or affect in any manner whatsoever, the validity, enforceability or effect of the remainder of the Contract Documents."

END OF SECTION – 00 93 00

SECTION 01 40 00 – QUALITY CONTROL

PART 1 – GENERAL

1.01 SUMMARY: This section specifies requirements for testing and inspecting.

A. All costs for testing and inspecting required by the Contract Documents and required by all governmental agencies shall be the expense of the Contractor.

B. All costs for supplemental testing and inspection requested by the Owner shall be the expense of the Owner unless tests indicate non-compliance. In the case of non-compliance, costs of non-compliance will be deducted from the contract sum and subsequent retesting required by the non-compliance shall be performed by the same testing laboratory with the associated costs paid by the Contractor.

1.02 QUALITY ASSURANCE:

A. Provide the services of a Testing Laboratory and a Soils Engineer approved by the Architect/ Engineer of Record.

B. Submittals: Upon completion of each test and/or inspection, promptly distribute copies of the test or inspection reports, signed and certified by a supervising engineer of the testing laboratory. Provide one copy each to the Owner, Architect, Structural Engineer, and all governmental agencies requiring such reports, and to such other persons as directed by the Architect.

PART 2 – PRODUCTS

2.01 SPECIFIC TESTS AND INSPECTIONS: Provide all tests and inspections outlined in this section, required by the Contract Documents, required by governmental agencies having jurisdiction, and required by all governing codes, regulations and statutes.

2.02 COOPERATION WITH TESTING LABORATORIES: Provide access to the Work at all times for representatives of the testing laboratories. The Contractor shall initiate and coordinate all testing and inspections.

2.03 TAKING SPECIMENS: Except as may be otherwise specifically approved by the Architect, have the testing laboratory secure and handle all samples and specimens for testing.

PART 3 – EXECUTION

3.01 SOIL INSPECTING AND TESTING: See Volume 3 for additional requirements. Make required inspections and tests including, but not limited to:

A. Visually inspect on-site and imported fill and backfill, making such test and retests as necessary to determine compliance with the Contract Documents.

B. Make field density tests on samples from in-place material in accordance with ASTMD 1557 (sand cone method) or D2922 unless these tests are inadequate due to the type of soil encountered.

C. Inspect and test the scarfing and recompacting of cleaned subgrade. Inspect the progress of excavation, fills, and backfills.

3.02 CONCRETE INSPECTION AND TESTING:

A. Portland Cement: Secure from the cement manufacturer the Certificates of Compliance delivered directly to the concrete producer for submission to the testing laboratory. Require the Certificates of Compliance to positively identify the cement as to production lot, bin, or silo number, dating and routing of the shipment, and compliance with the specified standards. If so required by the Architect, promptly provide such other specific physical and chemical data as requested.

B. Aggregate: Provide one test unless character of material changes, material is substituted, or additional tests are requested by the Architect. Take samples from the conveyor belts or batching gates at the ready mix plant for a) Sieve analysis to test for specified standards and grading analysis, and b) Specific gravity test for compliance with specified standards.

C. Laboratory Design Mix: After approval of aggregate and whenever character or source of materials change, provide a mix design in accordance with the Concrete Work Section 03 30 00. All mix designs shall be prepared by a civil engineer licensed in the state in which the project is located.

D. Molded Concrete Cylinders: Provide three test cylinders for each 100 cubic yards (or less if required by governing agencies), or fraction thereof, of each class of concrete of each day’s placement. Test one cylinder at 7 days, one at 28 days, and one when so directed, but in no case later than 49 days. Report the mix, slump, age, date sample taken, location of concrete in structure, and all test results. Take specimens and make tests in accordance with applicable ASTM standard specifications.

E. Core Tests: Provide only when specifically so directed by the Owner because of low cylinder test results. Cut from locations directed by the Architect, securing in accordance with ASTM C42, and prepare and test in accordance with ASTM C39.

F. Placement Inspections: On concrete over 2,000 psi, provide continuous or other inspection as required by governmental agencies, or as required by the Contract Documents, which ever is more restrictive. Throughout progress of concrete placement, make slump tests to verify conformance with the specified slump. Verify that finished concrete surfaces conform to the level or slope required by the Contract Documents.

3.03 CONCRETE AND MASONRY REINFORCEMENT INSPECTION AND TESTING: See Section 03 30 00 and Section 04 22 00 for additional information. Prior to use, test all reinforcement steel bars for compliance with the specified standards.

A. Material identified by mill test reports and certified by the testing laboratory does not require additional testing. The supplier shall furnish mill test reports laboratory for certifications. Tag identifying steel at the supplier's shop. When steel arrives at the job site without such tags, it shall be tested as unidentified reinforcing steel.

B. The testing laboratory shall select two pieces of unidentified reinforcing steel, each 24" long, for each size and grade. Provide one tensile test and one bend test for each 2½ tons or fraction thereof of each size and grade.

C. Provide continuous inspection for all welding of reinforcement steel.

3.04 MASONRY INSPECTION AND TESTING:

A. Compressive Strength Tests: Provide tests in accordance with ASTM E447. One set, consisting of two specimens of each as indicated below, shall be secured by the testing laboratory 30 days prior to the Work involving masonry units. Test one specimen at 7 days and one at 28 days. Upon start of masonry work, one set of specimens shall be taken for every 5,000 square feet of wall and tested at 7 and 28 days also.
   1. Masonry Units: ASTM C140
   2. Mortar: ASTM C270
   3. Grout: ASTM C1019
   4. Masonry Prisms: ASTM E447, Methods A and B.

3.05 STRUCTURAL STEEL INSPECTION AND TESTING: See Section 05 11 00 for additional information.

A. Prior to use, test all structural steel for compliance with the specified standards. Material identified by mill, and certified by the testing laboratory, does not require additional testing. The supplier shall furnish heat number, mill analysis, and mill test reports to the testing laboratory for certification. Tag identified steel at the supplier's shop. When steel arrives at the job site without such tags, test it as unidentified structural steel.

B. The testing laboratory shall make one tensile test and one bend test for each 5 tons, or fraction thereof, of each shape and size of unidentified structural steel.

C. Shop Welding: Provide a qualified testing laboratory inspector if the shop fabricator is not licensed and approved by appropriate governing authorities. On single pass welds, inspect after completion of welding but prior to painting. On multiple pass welds and on butt welds with cover pass on the back side, provide continuous inspection.

D. Field Welding: Provide continuous inspection by a qualified testing laboratory inspector, who is licensed and approved by appropriate governing authorities.

3.06 WAIVER OF INSPECTION AND/OR TEST: Specified inspections and/or tests may be waived only by the specific approval of the Architect, and such waivers will be expected to result in a credit to the Owner equal to the normal costs of such inspection and/or test.

END OF SECTION

SECTION 03 30 00 – CONCRETE WORK

PART 1 – GENERAL

1.01 Requirements of Division 00 and Division 01 apply to the Work of this Section.

Additional requirements contained in the following sections:

A. Section 03300 Volume 3 of the project specifications manual.
B. Section 03400 Volume 3 of the project specifications manual.
C. Section 04200 Volume 3 of the project specifications manual.

1.02 DESCRIPTION OF WORK: Provide all concrete footings, foundations, and flatwork, including all reinforcement and finishes.

A. Related Documents: Testing and inspections are specified in Section 01 40 00.
B. Installation requirements for ULTRAFLOR® architectural polished concrete system. Complete installation details are provided in the DIAMATIC® Technical brochures available at www.diamaticusa.com , www.ultraflor.com. ULTRAFLOR® is the basis of design for the polished concrete system, contractor may submit alternate system of equal or better quality for review and approval by the architect/engineer of record.

1.03 SUBMITTALS:

A. Product Data: Submit data for concrete mix design, proprietary materials and items.
B. Installer Qualifications for floor finishes: Data for company, principal personnel, experience, and training. Provide a letter documenting installer's accreditation and certification compliance, as specified under quality assurance.
C. Test reports: Provide field quality control test for all cast in place concrete upon delivery. Field tests shall include the following: slump (ASTM C143/C143M), air content (C231/C231M or C173/C173m), temperature (C1064/C1064M), unit weight (C138/C138M), and compressive strength (ASTM C31/C31M and ASTM C39/C39M). Field tests of concrete shall be made by an ACI Concrete Field Testing Technician –Grade I or equivalent. Testing personnel must be granted full access to the jobsite to conduct any and all required testing.

1.04 QUALITY ASSURANCE: Except where different requirements are specified, comply with the latest versions of the following specifications and standards by the, American Concrete Institute (ACI), and ASTM standard testing methods.

A. Comply with ACI 315 "Manual of Standard Practice for Detailing Reinforced Concrete Structures".

B. Codes and Standards: Comply with provisions of following codes and standards, ACI 301 “Specifications for Structural Concrete for Buildings”, ACI 318 “Building Code Requirements for Reinforced Concrete”, and Concrete Reinforcing Steel Institute (CRSI) “Manual of Standard Practice”.

C. Concrete Testing Service: Engage a testing laboratory to perform concrete testing and inspection services as specified in section 01 40 00.

D. ACI 117: Standard Specifications for Tolerances for Concrete Construction and Materials. Section 4.5.6.

E. ACI 304R: Recommended Practice for Measuring, Mixing, Transporting, and Placing Concrete.

F. ACI 310R-13: Guide to Decorative Concrete. Section 7.2.

G. ACI 302 1R-15: Guide for Concrete Floor and Slab Construction.

H. ACI 305R: Standard Specification for Hot Weather Concreting.

I. ACI 306R: Standard Specification for Cold Weather Concreting.

J. ACI 308.1: Standard Specification for Curing Concrete.

K. ASTM C150: Standard Specification for Portland Cement.

L. ASTM C143: Slump Measurement.

M. ASTM C231: Air Content.

N. ASTM C1064: Concrete Temperature.

O. ASTM C138: Unit Weight.

P. ASTM C31: Compressive Strength

Q. ASTM C979-10: Standard specification for pigments for integrally colored concrete.

R. ASTM E-1155: Standard Method for determining floor flatness and floor levelness.

S. ASTM C-1260: Standard Test Method for Potential Alkali Reactivity of Aggregates.

T. ASTM C1602: Standard Specification for Mixing Water Used in the Production of Hydraulic Cement Concrete.

U. ASTM C94: Standard Specification for Ready Mixed Concrete.

V. ASTM C494: Standard Specification for Chemical Admixtures for Concrete.

W. ASTM C618: Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use in Concrete.

X. ASTM C171: Standard Specification for Sheet Materials for Curing Concrete.

Y. ASTM E1745: Standard Specification for Plastic Water Vapor Retarders UNDER CONCRETE.

1.05 PROJECT CONDITIONS:

A. Cover completed Work with sufficient cover to protect footings and adjacent subgrade against freezing.

B. Protect adjacent finish materials against spatter during concrete placement.

PART 2 – PRODUCTS

2.01 FORM MATERIALS: Construct formwork for exposed concrete surfaces with plywood, metal, metal-framed plywood faced, or other acceptable panel-type materials.

2.02 REINFORCING MATERIALS:

A. Reinforcing Bars: For #4 bars or larger, ASTM A 615, Grade 60, deformed; for #4 and smaller, ASTM A 615, Grade 40.

B. Welded Wire Fabric: ASTM A 185, welded steel wire fabric.

C. Supports for Reinforcement: Provide supports for reinforcing bars and welded wire fabric. Use supports complying with CRSI recommendations.

2.03 CONCRETE MATERIALS.

A. Portland Cement: ASTM C 150, Type V, also see geotechnical report.

B. Normal Weight Aggregates: ASTM C 33, and as herein specified.

C. Lightweight Aggregates: ASTM C 330.

D. Water: Drinkable.

E. Air-Entraining Admixture: ASTM C 494, Type A and UBC Standard No. 26-9.

F. Water-Reducing Admixture: ASTM C 494, Type A and UBC Standard No. 26-9.

2.04 RELATED MATERIALS:

A. Vapor Retarder: Polyethylene sheet not less than 10 mils thick in compliance with ASTM E1745 or as required in soils report.

B. Chemical Hardener: "EDCO" concrete floor hardener, Code #2020; "Burk-O-Lith", The Burke Co.; or equal.

C. Liquid Membrane-Forming Curing Compound complying with ASTM C 309, Type 1, Class A. "Deketon"; Nox-Crete Chemicals, Inc.; "Kure-N-Seal, System CS10; Sonneborn-Rexnord; "Triple-Seal"; Protex Industries, Inc.; or equal.

D. Moisture-Retaining Cover: Comply with ASTM C 171. Waterproof paper, Polyethylene film, or Polyethylene-coated burlap.

E. Rock Salt: Ordinary Sodium Chloride packaged water softener salt. Size shall be course with a gradation that permits 100% to pass a 3/8" sieve and 85% to remain on the #8 sieve.

F. Expansion Joint Material: Asphalt impregnated, ½" thick, "Flexcell" or approved equal.

2.05 PROPORTIONING AND DESIGN OF MIXES: Prepare design mixes for each type and strength of concrete in accordance with applicable provisions of ASTM C 94 and ACI 301. Allow a maximum slump of 4".

2.06 ADMIXTURES: Use air-entraining admixture in exterior exposed concrete subject to freeze and thaw, unless otherwise indicated. Use admixtures for water-reducing and set control in strict compliance with manufacturer's directions. Contractor shall confirm use of admixtures for all floor systems comply with the requirements of the specific system manufacturer.

2.07 CONCRETE MIXING: Comply with requirements of ASTM C 94.

PART 3 – EXECUTION

3.01 GENERAL: Coordinate the installation of joint materials and vapor retarders with placement of forms and reinforcing steel.

3.02 FORMS: Construct forms complying with ACI 347 to sizes, shapes and dimensions shown. Provide for openings and other features required in the Work. Solidly butt joints and provide back-up at joints to prevent leakage of cement paste.

A. Cleaning and Tightening: Thoroughly clean forms and adjacent surfaces to receive concrete. Retighten forms and bracing after concrete placement to eliminate mortar leaks and maintain proper alignment.

3.03 PLACING REINFORCEMENT: Comply with Concrete Reinforcing Steel Institute's recommended practice for "Placing Reinforcing Bars".

A. Clean reinforcement of loose rust and mill scale and other materials which reduce or destroy bond.

3.04 JOINTS: Install construction joints as shown on the drawings but so as not to impair strength and appearance of the structure, but in no instance shall the area of the slab exceed 200 s.f. between joints. Place construction joints perpendicular to main reinforcement. Continue reinforcement across construction joints.

A. Isolation Joints in Slabs: Construct at points between slabs and vertical surfaces. Install resilient, non-extruding type, premolded bituminous impregnated fiberboard; ASTM-D-1751 or AASHOM-12.

B. Contraction (Control) Joints in Slabs and Sidewalks: Construct to form panels of patterns as shown, or not exceeding 15' in either direction. Use saw cuts 1/8" x 1/4 of slab depth.

C. Expansion Joints: Install preformed expansion joint filler 1/2" wide x depth of concrete sidewalk. Keep filler down 1/2" from top of concrete and apply elastomeric sealant as specified elsewhere.

D. Tooled Joints: Form with the use of an edging tool and straight edge guide.

3.05 INSTALLATION OF EMBEDDED ITEMS: Build into work embedded items required for other Work attached to, or supported by, cast-in-place concrete.

3.06 CONCRETE PLACEMENT: Before placing concrete, inspect and complete all preparatory Work necessary. Moisten wood forms immediately before placing concrete. Comply with ACI 304 "Recommended Practice for Measuring, Mixing, Transporting and Placing Concrete". Deposit concrete continuously so as not to cause seams or planes of weakness.

A. Placing Concrete in Forms: Deposit concrete in forms in horizontal layers not deeper than 24". Place each layer while preceding layer is still plastic.

B. Cold Weather Placing: Protect concrete from frost, freezing actions, or low temperatures, in compliance with ACI 306.

C. Hot Weather Placing: When hot weather conditions exist place concrete in compliance with ACI 305.

D. Keep a record of the time and date of placing all concrete in each portion of the project. Make this record open to the inspection of the Engineer/Architect the same day.

E. Carry on concrete placing, once started, as a continuous operation until the section of approved reinforcement, size and shape is completed. Use pour cut offs of approved details and locations.

F. A proper screeding method or mechanism shall be used to insure the flatness requirements are met. Acceptable methods include the use of a laser screed, a mechanical vibrating screed including a roller or tube screed, a Morrison screed or similar type.

G. If the continuous pour is interrupted for any reason it shall be documented and this detailed report shall be presented to the architect the same day.

3.07 FINISH OF FORMED SURFACES:

A. Rough Form Finish: For formed concrete surfaces not exposed-to-view, fins and other projections exceeding ¼" in height shall be rubbed down or chipped off.

B. Smooth Form Finish: For formed concrete surfaces exposed to view, repair and patch defective areas with fins or other projections completely removed and smoothed.

C. Grout Cleaned Finish (Sack Finish): Combine one part Portland cement to 1½ parts fine sand by volume, and mix with water to consistency of thick paint. Thoroughly wet concrete surfaces and apply grout to coat surfaces and fill small holes. Remove excess grout by scraping and rubbing with clean burlap. Keep damp by fog spray for at least 36 hours after rubbing.

D. Related Unformed Surfaces: Strike-off smooth and finish with a texture matching adjacent formed surfaces.

3.08 MONOLITHIC SLAB FINISHES:

A. Tolerance: ¼" in 10' when tested with a 10' straight edge. Slope surfaces uniformly to drains where required.

B. Scratch Finish: Apply to monolithic slab surfaces that are to receive concrete floor topping or mortar setting beds.

C. Float Finish: Apply float finish to slab surfaces to receive trowel finish and other finishes as hereinafter specified.

D. Trowel Finish: Apply trowel finish to slab surfaces to be exposed-to-view and to be covered with resilient flooring.

E. Non-Slip Broom Finish: Apply non-slip broom finish to exterior concrete platforms, sidewalk, steps, ramps and elsewhere as indicated.

F. Rock Salt Finish: Apply to exterior finish slab surfaces to be exposed to view as indicated on drawings. Spread evenly at a rate of 4 lbs per 100 square feet. Press salt into surface leaving tops of grains exposed. After 7 days wash grains out of concrete surface with clear water.

G. Retarder Finish: Concrete to have this finish shall have 45% / 55%, 3/8" pea gravel to sand and a seven sack of cement per yard mix. Apply retarding chemical to freshly placed concrete and wash off according to retarding chemical manufacturer's instructions.

H. Colored Finish: Hand broadcast dry color to freshly placed concrete at rate directed by manufacturer and trowel in. Apply as directed by manufacturer's instructions.

I. Colored Finish: Color admixture added during mixing process at plant. Formulate as directed by manufacturer.

J. ULTRAFLOR® Finish: In accordance with ACI 302 1R in areas applied, the required finish shall be smooth trowel finish, not burned. At the contractors choice he may use combo blades or Teflon blades for the final finish as long as a minimum amount of steel is left on the surface. Plastic blades may be used as necessary per manufacturer's recommendations. Blade pitch angle shall be kept as low as possible through the entire finishing process to minimize surface stresses and fine aggregate pop-out. The blade pitch shall be adjusted to prevent any tiger stripping or blade patterns on the surface No water shall be used on the surface during any finishing steps.

3.09 CONCRETE CURING AND PROTECTION: Protect freshly placed concrete from premature drying excessive cold or hot temperatures. Start curing as soon as free water has disappeared. Continue for at least 7 days in accordance with ACI 301 procedures. Formwork not supporting weight of concrete may be removed after curing at not less than 50 deg F (10 deg C) for 24 hours. Formwork supporting weight of concrete may not be removed in less than 14 days and until concrete has attained design minimum compressive strength at 28 days.

A. ULTRAFLOR® CURING:
   i. If specified by the architect or engineer a moisture cure conforming to ASTM C171 may be performed.
   ii. At no time will a membrane forming, or resin based curing compound be used as an approved method as the depth of penetration exceeds that

surface area to receive grinding and polishing. Solvent borne material will limit exposure and penetration of densifier, coloring treatments and protection products.

iii. The curing method and its affects may be demonstrated on the physical mock-up panel before slab construction if schedule permits. Physical curing membranes or blankets may cause differential curing or surface marking and should be avoided when possible.

iv. NO MEMBRANE FORMING CURING COMPOUNDS SHALL BE APPLIED TO THE FINISH FLOOR.

3.10 PROTECTION OF WORK:

A. To prevent damage from trade traffic during build out of site, an approved Construction grade flooring protection material for the concrete systems installed shall be installed.

B. Floor covering shall be maintained until the contractor is able to install final floor finishes. After completion of final floor finishes the area shall be protected in the same manner until the floor is turned over to the owner.

C. Prior to and during installation of floor finishes the floor must be kept free to debris or contaminates that may affect the finished surface. This will include any construction chemicals, adhesives, paint, or other materials that may cause damage to the surface.

END OF SECTION

SECTION 04 21 13.13 – ADHERED MASONRY VENEER

PART 1 – GENERAL

1.01 Requirements of Division 00 and Division 01 apply to the Work of this Section.

1.02 DESCRIPTION OF WORK: The extent of Adhered Masonry Veneer is shown on the drawings.

A. Related Documents: Rough Carpentry is specified in Section 06 10 00 and Lath and Plaster is specified in Section 09 24 00.

1.03 SUBMITTALS:

A. Samples: Submit samples of each type of Adhered Masonry Veneer required. Each set of samples to include the full range of color and texture expected in finished work.

B. Job Site Mock-up Samples: Upon review and acceptance of samples by the Architects, the Contractor shall prepare job site mock-up as specified in 1.04 Quality Assurance.

1.04 QUALITY ASSURANCE: Obtain Adhered Masonry Veneer units of uniform texture and color or uniform blend as indicated on the drawings.

A. Job Site Mock-up: The Contractor shall prepare 4’ x 4’ sample wall panel mock-up using actual materials, finishes, bond and joint tooling required for final work for Owner’s review and approval. The mock-ups shall be prepared concurrently with all other mock-ups required by the other sections of the specifications. The Contractor shall prepare all mock-ups and obtain the approval from the Owner prior to ordering any material for the project. Retain mock-up during construction as a standard for judging completed Adhered Masonry Veneer work. Do not alter, move or destroy mock-up until the Work is completed.

1.05 JOB CONDITIONS: Store Adhered Masonry Veneer materials off the ground and covered.

PART 2 – PRODUCTS

2.01 MATERIALS: Unless otherwise indicated, provide standard face veneer brick (7 5/8” long x 2 ½” high). Provide molded corner units and other special molded shapes where shown.

A. Veneer Brick: ASTM C216, grade SW for exposed brick, type FBS, normal size and color variations.

B. Thin set Mortar: Commercial grade specifically formulated for the purpose and composed of latex mixed with portland cement, or provide such other thin set mortar as approved by the Architect. Recommended thin set mortar: Orco Blended Products, VBM-Poly Thin Brick or equal.

C. Mortar: ASTM C270, type "S" Proportion Specification, with special color added to match sample.

PART 3 – EXECUTION

3.01 INSPECTION: Examine areas and conditions under which Adhered Masonry Veneer work is to be installed. Do not proceed with the Work until satisfactory conditions have been corrected.

3.02 INSTALLATION: Thoroughly clean the substrate free of debris and any substance which will not bond with the mortar. Lay out walls in advance for accurate spacing of bond patterns with uniform joint widths and to properly locate openings, joints, returns and offsets. Install in accordance with the manufacturer's recommendations and the Masonry Industry Advancement Committee standards and specifications.

A. Mortar Joints: Tool exposed joints to be 3/8".

B. Control and Expansion Joints: Provide vertical expansion, control and isolation joints in masonry where shown or required. Align Adhered Masonry Veneer units with expansion joints in substrate.

3.03 REPAIR, POINTING AND CLEANING:

A. Repair: Replace Adhered Masonry Veneer units which are loose, chipped, broken, stained or otherwise damaged.

B. Pointing: During the tooling of joints, enlarge any voids or holes, except weep-holes, and completely fill with mortar. Point all joints including corners, openings and adjacent Work to provide a neat, uniform appearance, properly prepared for application of caulking or sealant compounds.

C. Cleaning: Take care during construction to keep Adhered Masonry work clean. Dry work as much as possible. Clean the Work with solutions approved by manufacturer.

3.04 SEALING: After cleaning operations, apply water repellent wall coating over finished Adhered Masonry Veneer work.

END OF SECTION

SECTION 05 11 00 – STRUCTURAL STEEL AND MISCELLANEOUS METAL WORK

PART 1 – GENERAL

1.01 Requirements of Division 00 and Division 01 apply to the Work of this Section.

1.02 DESCRIPTION OF WORK: Provide complete structural and miscellaneous steel work, including ladders, hardware and guardrails as shown on the drawings.

1.03 SUBMITTALS:

A. Shop Drawings: Furnish shop drawings, including complete details and schedules for fabrication and assembly of structural steel members.

1.04 QUALITY ASSURANCE: Comply with provisions of following, except as otherwise indicated.

A. AISC “Code of Standard Practice for Steel Buildings and Bridges.”

B. AISC “Specifications for the Design, Fabrication, and Erection of Structural Steel for Buildings”, including the “Commentary” and Supplements thereto as issued.

C. AISC “Specifications for Structural Joints using ASTM A 325 or A 490 Bolts” approved by the Research Council on Riveted and Bolted Structural Joints of the Engineering Foundation.

D. AWS D1.1 “Structural Welding Code”.

E. Qualify welding processes and welding operators in accordance with AWS “Standard Qualification Procedure”.

1.05 DELIVERY, STORAGE AND HANDLING: Protect steel members and packaged materials from erosion and deterioration.

PART 2 – PRODUCTS

2.01 MATERIALS:

A. Structural Steel Shapes, Plates and Bars: ASTM A 36.

B. Cold-Formed Steel Tubing: ASTM A 500, Grade B.

C. Steel Pipe: ASTM A 53, Type E or S, Grade B.

D. Unfinished Threaded Fasteners: ASTM A 307, Grade A.

E. High-Strength Threaded Fasteners: Bolts, nuts and washers, complying with ASTM A 325.

F. Electrodes for Welding: Comply with AWS Code, E70 low hydrogen.

G. Structural Steel Primer Paint: Red oxide, oil alkyd; TT-P-86, Type II.

H. Metallic Shrinkage-Resistant Grout: Corps of Engineers CRD-C588, Type M.

2.02 FABRICATION: Fabricate items of structural steel in accordance with AISC Specifications.

A. Welded Construction: Comply with AWS Code for procedures, appearance and quality of welds, and methods used in correcting welding work.

B. Galvanized items: ASTM A120.

2.03 SHOP PAINTING: Paint structural steel, except those members or portions to be embedded in concrete or mortar.

PART 3- EXECUTION

3.01 INSPECTION: Examine areas where structural steel is to be installed and correct any unsatisfactory conditions that may occur.

3.02 ERECTION: Set structural frames accurately to lines and elevations indicated.

A. Comply with AISC Specifications.

B. Touch-up painting: Immediately after erection, apply paint to exposed areas with same material used for shop painting.

END OF SECTION

SECTION 05 20 00 – STEEL JOISTS

PART 1 – GENERAL

1.01 Requirements of Division 00 and Division 01 apply to the Work of this Section.

1.02 DESCRIPTION OF WORK: Provide a complete steel joist system.

A. Related Documents: Structural steel is specified in Section 05 11 00.

1.03 SUBMITTALS:

A. Product Data: Submit manufacturer's specifications and installation instructions for each type of joist and accessories.

B. Shop Drawings: Furnish drawings showing all critical dimensions, templates and locations for installation of anchor bolts. Show loads and details for bridging and bracing as well as all connections and fastenings. Provide a copy of the design calculations.

1.04 QUALITY ASSURANCE:

A. Provide joists fabricated in compliance with SJI "Standard Specifications, Load Tables and Weight Tables" for H-Series Open Web Steel Joists and LH-Series Longspan Steel Joists, latest edition.

B. Qualify welding processes and welding operators in accordance with the AWS "Standard Qualification Procedure".

1.05 PRODUCT DELIVERY, STORAGE AND HANDLING: Deliver, store and handle steel joists as recommended in SJI "Specifications".

PART 2 – PRODUCTS

2.01 MATERIALS:

A. Steel: Comply with SJI "Specifications".

B. High-Strength Threaded Fasteners: ASTM A325 or A490 heavy hexagon structural bolts with nuts and hardened washers.

C. Steel Prime Paint: Comply with SJI "Specifications", except asphalt type paint not permitted.

2.02 FABRICATION: Fabricate steel joists in accordance with SJI "Specifications".

PART 3 – EXECUTION

3.01 INSPECTION: Examine areas and conditions where steel joists are to be installed and correct any unsatisfactory conditions that may occur.

3.02 ERECTION: Place and secure steel joists in accordance with SJI “Specifications” and final shop drawings.

END OF SECTION

SECTION 05 30 00 – METAL DECKING

PART 1 – GENERAL

1.01 Requirements of Division 00 and Division 01 apply to the Work of this Section.

1.02 DESCRIPTION OF WORK: Provide a complete metal deck system.

A. Related Documents: Structural Steel and Miscellaneous Metal Work is specified in Section 05 11 00. Steel Joists are specified in Section 05 20 00.

1.03 SUBMITTALS:

A. Product Data: Submit manufacturer's specifications and installation instructions for each type of decking and accessories.

B. Shop Drawings: Furnish detailed drawings showing layout and types of deck panels, anchorage details, conditions requiring closure panels, supplementary framing, sump pans, cant strips, cut openings, special jointing or other accessories.

1.04 QUALITY ASSURANCE:

A. Comply with provisions of AISI "Specification for the Design of Cold-Formed Steel Structural Members", AWS DI-3 "Structural Welding Code – Sheet Steel", and SDI "Design Manual for Floor Decks and Roof Decks".

B. Qualify welding processes and welding operators in accordance with the AWS "Standard Qualification Procedure".

PART 2 – PRODUCTS

2.01 MATERIALS:

A. Steel for Painted Metal Deck Units: ASTM A611, Grade C.

B. Steel for Galvanized Metal Deck: ASTM A 446, Grade A.

C. Sheet Metal Accessories: ASTM A 526, commercial quality, galvanized.

D. Galvanizing: ASTM A 525, G60.

E. Galvanizing Repair Paint: High zinc-dust content paint for repair of damaged galvanized surfaces complying with military specifications MIL-P-21035 (Ships).

F. Paint: Manufacturer's baked-on, rust-inhibitive paint, for application to metal surfaces which have been chemically cleaned and phosphate chemical treated.

2.02 FABRICATION: Provide deck configurations complying with SDI “Roof Deck Specifications”.

PART 3 – EXECUTION

3.01 INSPECTION: Examine areas and conditions where metal decking is to be installed and correct any unsatisfactory conditions that may occur.

3.02 INSTALLATION: Install deck units and accessories in accordance with manufacturer’s recommendations and final shop drawings.

END OF SECTION

SECTION 054000 - COLD-FORMED METAL FRAMING

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Exterior load-bearing wall framing.
2. Interior load-bearing wall framing.
3. Exterior non-load-bearing wall framing.
4. Floor joist framing.

1.2 PERFORMANCE REQUIREMENTS

A. Structural Performance: Provide cold-formed metal framing capable of withstanding design loads within limits and under conditions indicated.

1. Design Loads and Deflection Limits shall be as indicated on the Structural plans.

1.3 SUBMITTALS

A. Product Data: For each type of product and accessory indicated.

B. Shop Drawings: Show layout, spacings, sizes, thicknesses, and types of cold-formed metal framing; fabrication; and fastening and anchorage details, including mechanical fasteners.

1. For cold-formed metal framing indicated to comply with design loads, include structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

C. Welding certificates.

D. Qualification data.

E. Product test reports.

F. Research/evaluation reports.

1.4 QUALITY ASSURANCE

A. Product Tests: Mill certificates or data from a qualified independent testing agency indicating steel sheet complies with requirements.

B. Welding: Qualify procedures and personnel according to AWS D1.3, "Structural Welding Code--Sheet Steel."

C. Fire-Test-Response Characteristics: Where indicated, provide cold-formed metal framing identical to that of assemblies tested for fire resistance per ASTM E 119 by a testing and inspecting agency acceptable to authorities having jurisdiction.

D. AISI Specifications and Standards: Comply with AISI's "North American Specification for the Design of Cold-Formed Steel Structural Members" and its "Standard for Cold-Formed Steel Framing - General Provisions."

E. Metal Lath/Steel Framing Association Division of the National Association of Architectural Metal Manufacturers (NAAMM) ML/SFA920, current Edition, Guide Specifications for Metal Lathing and Furring.

F. ASTM Standards:
1. C841 Standard Specifications for Installation of Interior Lathing and Furring.
2. C1063 Installation of Lathing and Furring for Portland Cement Based Plaster.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Steel Sheet: ASTM A 1003/A 1003M, Structural Grade, Type H, metallic coated, of grade and coating weight as follows:

1. Grade: ST33H, ST50H.
2. Coating: G60 or equivalent.

2.2 LOAD-BEARING WALL FRAMING

A. Steel Studs: Manufacturer's standard C-shaped steel studs, of web depths indicated, punched, with stiffened flanges, as indicated in plans.

B. Steel Track: Manufacturer's standard U-shaped steel track, of web depths indicated, unpunched, with straight flanges, and same minimum base-metal thickness as steel studs.

C. Steel Box or Back-to-Back Headers: Manufacturer's standard C-shapes used to form header beams, of web depths indicated, punched, with stiffened flanges, and as indicated in plans.

2.3 EXTERIOR NON-LOAD-BEARING WALL FRAMING

A. Steel Studs: Manufacturer's standard C-shaped steel studs, of web depths indicated, punched, with stiffened flanges, and as indicated in plans.

B. Steel Track: Manufacturer's standard U-shaped steel track, of web depths indicated, unpunched, with unstiffened flanges, and same minimum base-metal thickness as steel studs.

C. Vertical Deflection Clips: Manufacturer's standard bypass or head clips, capable of accommodating upward and downward vertical displacement of primary structure through positive mechanical attachment to stud web.

D. Single Deflection Track: Manufacturer's single, deep-leg, U-shaped steel track; unpunched, with unstiffened flanges, of web depth to contain studs while allowing free vertical movement, with flanges designed to support horizontal and lateral loads.

E. Double Deflection Tracks: Manufacturer's double, deep-leg, U-shaped steel tracks, consisting of nested inner and outer tracks; unpunched, with unstiffened flanges.

2.4 FLOOR / ROOF JOIST FRAMING

A. Steel Joists: Manufacturer's standard C-shaped steel joists, of web depths indicated, unpunched, punched, and punched with enlarged service holes, with stiffened flanges, and as indicated in plans.

B. Steel Joist Track: Manufacturer's standard U-shaped steel joist track, of web depths indicated, unpunched, with unstiffened flanges, and as follows:

1. Minimum Base-Metal Thickness: Matching steel joists.
2. Flange Width: 2 inches minimum.

2.5 FRAMING ACCESSORIES

A. Fabricate steel-framing accessories from steel sheet, ASTM A 1003/A 1003M, Structural Grade, Type H, metallic coated, of same grade and coating weight used for framing members, unless otherwise indicated.

B. Steel Shapes and Clips: ASTM A 36/A 36M, zinc coated by hot-dip process according to ASTM A 123/A 123M.

C. Anchor Bolts: ASTM F 1554, threaded carbon-steel bolts and carbon-steel nuts; and flat, hardened-steel washers; zinc coated by hot-dip process according to ASTM A 153/A 153M, Class C.

D. Expansion Anchors: Fabricated from corrosion-resistant materials, with capability to sustain, without failure, a load equal to 5 times design load, as determined by testing per ASTM E 488 conducted by a qualified independent testing agency.

E. Power-Actuated Anchors: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with capability to sustain, without failure, a load equal to 10 times design load, as determined by testing per ASTM E 1190 conducted by a qualified independent testing agency.

F. Mechanical Fasteners: ASTM C 1513, corrosion-resistant-coated, self-drilling, self-tapping steel drill screws.

1. Head Type: Low-profile head beneath sheathing, manufacturer's standard elsewhere.

2.6 MISCELLANEOUS MATERIALS

A. Galvanizing Repair Paint: ASTM A 780.

B. Cement Grout: Portland cement, ASTM C 150, Type I; and clean, natural sand, ASTM C 404. Mix at ratio of 1 part cement to 2-1/2 parts sand, by volume, with minimum water required for placement and hydration.

C. Shims: Load bearing, high-density multimonomer plastic, nonleaching.

D. Sealer Gaskets: Closed-cell neoprene foam, 1/4 inch thick, selected from manufacturer's standard widths to match width of bottom track or rim track members.

PART 3 - EXECUTION

3.1 PREPARATION

A. Install load bearing shims or grout between the underside of wall bottom track or rim track and the top of foundation wall or slab at stud or joist locations to ensure a uniform bearing surface on supporting concrete or masonry construction.

B. Install sealer gaskets to isolate the underside of wall bottom track or rim track and the top of foundation wall or slab at stud or joist locations.

3.2 INSTALLATION, GENERAL

A. Install cold-formed metal framing according to AISI's "Standard for Cold-Formed Steel Framing - General Provisions" and to manufacturer's written instructions unless more stringent requirements are indicated.

B. Install cold-formed metal framing and accessories plumb, square, and true to line, and with connections securely fastened.

C. Install framing members in one-piece lengths.

D. Install temporary bracing and supports to secure framing and support loads comparable in intensity to those for which structure was designed. Maintain braces and supports in place, undisturbed, until entire integrated supporting structure has been completed and permanent connections to framing are secured.

E. Do not bridge building expansion and control joints with cold-formed metal framing. Independently frame both sides of joints.

F. Install insulation, specified in Division 07 Section "Thermal Insulation," in built-up exterior framing members, such as headers, sills, boxed joists, and multiple studs at openings, that are inaccessible on completion of framing work.

G. Fasten hole reinforcing plate over web penetrations that exceed size of manufacturer's standard punched openings.

H. Erection Tolerances: Install cold-formed metal framing level, plumb, and true to line to a maximum allowable tolerance variation of 1/8 inch in 10 feet and as follows:

1. Space individual framing members no more than plus or minus 1/8 inch from plan location. Cumulative error shall not exceed minimum fastening requirements of sheathing or other finishing materials.

3.3 LOAD-BEARING WALL INSTALLATION

A. Install continuous top and bottom tracks sized to match studs. Align tracks accurately and securely anchor at corners and ends, and at spacings as follows:

1. Anchor Spacing: As indicated.

B. Squarely seat studs against top and bottom tracks with gap not exceeding of 1/8 inch between the end of wall framing member and the web of track. Fasten both flanges of studs to top and bottom tracks. Space studs as follows:

1. Stud Spacing: As indicated.

C. Set studs plumb, except as needed for diagonal bracing or required for nonplumb walls or warped surfaces and similar configurations.

D. Align studs vertically where floor framing interrupts wall-framing continuity. Where studs cannot be aligned, continuously reinforce track to transfer loads.

E. Align floor and roof framing over studs. Where framing cannot be aligned, continuously reinforce track to transfer loads.

F. Anchor studs abutting structural columns or walls, including masonry walls, to supporting structure as indicated.

G. Install headers over wall openings wider than stud spacing. Locate headers above openings as indicated. Fabricate headers of compound shapes indicated or required to transfer load to supporting studs, complete with clip-angle connectors, web stiffeners, or gusset plates.

1. Frame wall openings with not less than a double stud at each jamb of frame as indicated on Shop Drawings. Fasten jamb members together to uniformly distribute loads.
2. Install runner tracks and jack studs above and below wall openings. Anchor tracks to jamb studs with clip angles or by welding, and space jack studs same as full-height wall studs.

H. Install supplementary framing, blocking, and bracing in stud framing indicated to support fixtures, equipment, services, casework, heavy trim, furnishings, and similar work requiring attachment to framing.

1. If type of supplementary support is not indicated, comply with stud manufacturer's written recommendations and industry standards in each case, considering weight or load resulting from item supported.

I. Install horizontal bridging in stud system, spaced as indicated. Fasten at each stud intersection.

1. Bridging: Cold-rolled steel channel, welded or mechanically fastened to webs of punched studs with a minimum of 2 screws into each flange of the clip angle for framing members up to 6 inches deep.
2. Bridging: Combination of flat, taut, steel sheet straps of width and thickness indicated and stud-track solid blocking of width and thickness to match studs. Fasten flat straps to stud flanges and secure solid blocking to stud webs or flanges.
3. Bridging: Proprietary bridging bars installed according to manufacturer's written instructions.

J. Install steel sheet diagonal bracing straps to both stud flanges, terminate at and fasten to reinforced top and bottom tracks. Fasten clip-angle connectors to multiple studs at ends of bracing and anchor to structure.

K. Install miscellaneous framing and connections, including supplementary framing, web stiffeners, clip angles, continuous angles, anchors, and fasteners, to provide a complete and stable wall-framing system.

3.4 EXTERIOR NON-LOAD-BEARING WALL INSTALLATION

A. Install continuous tracks sized to match studs. Align tracks accurately and securely anchor to supporting structure as indicated.

B. Fasten both flanges of studs to bottom track, unless otherwise indicated. Space studs as indicated.

C. Set studs plumb, except as needed for diagonal bracing or required for nonplumb walls or warped surfaces and similar requirements.

D. Isolate non-load-bearing steel framing from building structure to prevent transfer of vertical loads while providing lateral support.

1. Install single deflection tracks and anchor to building structure.
2. Install double deflection tracks and anchor outer track to building structure.
3. Connect vertical deflection clips to studs and anchor to primary building structure.

E. Install horizontal bridging in wall studs, spaced in rows indicated on Shop Drawings but not more than 48 inches apart. Fasten at each stud intersection.

1. Top Bridging for Single Deflection Track: Install row of horizontal bridging within 12 inches of single deflection track. Install a combination of flat, taut, steel sheet straps of width and thickness indicated and stud or stud-track solid blocking of width and thickness matching studs. Fasten flat straps to stud flanges and secure solid blocking to stud webs or flanges.

    a. Install solid blocking at centers indicated.

2. Bridging: Cold-rolled steel channel, welded or mechanically fastened to webs of punched studs.
3. Bridging: Combination of flat, taut, steel sheet straps of width and thickness indicated and stud-track solid blocking of width and thickness to match studs. Fasten flat straps to stud flanges and secure solid blocking to stud webs or flanges.
4. Bridging: Proprietary bridging bars installed according to manufacturer's written instructions.

F. Install miscellaneous framing and connections, including stud kickers, web stiffeners, clip angles, continuous angles, anchors, fasteners, and stud girts, to provide a complete and stable curtain-wall-framing system.

3.5 JOIST INSTALLATION

A. Install perimeter joist track sized to match joists. Align and securely anchor or fasten track to supporting structure at corners, ends, and spacings indicated on Shop Drawings.

B. Install joists bearing on supporting frame, level, straight, and plumb; adjust to final position, brace, and reinforce. Fasten joists to both flanges of joist track.

1. Install joists over supporting frame with a minimum end bearing of 1-1/2 inches.
2. Reinforce ends and bearing points of joists with web stiffeners, end clips, joist hangers, steel clip angles, or steel-stud sections as indicated on Shop Drawings.

C. Space joists not more than 2 inches from abutting walls, and as follows:

1. Joist Spacing: As indicated.

D. Frame openings with built-up joist headers consisting of joist and joist track, nesting joists, or another combination of connected joists if indicated.

E. Install joist reinforcement at interior supports with single, short length of joist section located directly over interior support, with lapped joists of equal length to joist reinforcement, or as indicated.

1. Install web stiffeners to transfer axial loads of walls above.

F. Install bridging at intervals indicated. Fasten bridging at each joist intersection as follows:

1. Bridging: Joist-track solid blocking of width and thickness indicated, secured to joist webs.

2. Bridging: Combination of flat, taut, steel sheet straps of width and thickness indicated and joist-track solid blocking of width and thickness indicated. Fasten flat straps to bottom flange of joists and secure solid blocking to joist webs.

G. Secure joists to load-bearing interior walls to prevent lateral movement of bottom flange.

H. Install miscellaneous joist framing and connections, including web stiffeners, closure pieces, clip angles, continuous angles, hold-down angles, anchors, and fasteners, to provide a complete and stable joist-framing assembly.

3.6 FIELD QUALITY CONTROL

A. Testing: Owner will engage a qualified independent testing and inspecting agency to perform field tests and inspections and prepare test reports.

B. Field and shop welds will be subject to testing and inspecting.

C. Testing agency will report test results promptly and in writing to Contractor and Architect.

D. Remove and replace work where test results indicate that it does not comply with specified requirements.

E. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

3.7 REPAIRS AND PROTECTION

A. Galvanizing Repairs: Prepare and repair damaged galvanized coatings on fabricated and installed cold-formed metal framing with galvanized repair paint according to ASTM A 780 and manufacturer's written instructions.

B. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer, that ensure that cold-formed metal framing is without damage or deterioration at time of Substantial Completion.

END OF SECTION 05 40 00

SECTION 06 10 00 – ROUGH CARPENTRY

PART 1 – GENERAL

1.01 Requirements of Division 00 and Division 01 apply to the Work of this Section.

1.02 DESCRIPTION OF WORK: Rough Carpentry includes sheathing, equipment platforms, wood framing, wood grounds, nailers, blocking, draftstops, sleepers, curbs, wood furring, mounting boards for equipment and all miscellaneous rough carpentry items required by the drawings and as necessary for a complete project.

A. Related Documents: Finish Carpentry and Millwork is specified in Section 06 20 00, Hardware is specified in Section 08 71 00, and Wood Doors are specified in section 08 14 00.

1. Contractor's Option: General Contractor has option to use wood stud or metal stud system for non-bearing partitions except where wood framing is used structurally.

1.03 QUALITY ASSURANCE:

A. Lumber Standards: PS 20 and rules of the grading and inspecting agencies for species and products indicated.

B. Plywood Product Standards: PS 1 (ANSI A 199.1) and applicable APA Performance Standard type of panel indicated.

1.04 DELIVERY, STORAGE AND HANDLING: Keep materials dry. Protect against exposure to weather and contact with damp or wet surfaces. Stack lumber and plywood, and provide air circulation within stacks.

PART 2 – PRODUCTS

2.01 MATERIALS:

A. All lumber shall be factory marked with type, grade, mill and grading agency.

B. Provide dressed lumber, S4S, unless otherwise indicated.

C. Provide seasoned framing lumber with 19% maximum moisture content at time of dressing.

D. For light framing (less than 6 wide), provide "Stud" grade lumber for stud framing and "Standard" grade for other light framing, any species. For structural framing (6" and wider and for 2" to 4 thick) provide Douglas Fir, No. 1 grade unless otherwise noted on structural drawings.

E. Trademark: Identify each plywood panel with appropriate APA trademark.

F. Roof Sheathing: APA rated sheathing Group 1 and Structural 1, APA C-D Ext.

G. Wall Sheathing: APA rated sheathing with exterior exposure durability classification.

H. Plywood Backing Panels: For mounting electrical or telephone equipment and as backing for plastic laminate, APA CD PLUGGED INT with exterior glue, ½" thickness.

2.02 ROUGH CARPENTRY HARDWARE: Shall conform to UBC Standard No. 25-17.

A. Nails: Steel common nails for framing. Hot-dipped zinc-coated nails wherever exposed. Deformed shank nails for fastening underlayment.

B. Bolts and Screws: Shall conform to ASTM A307.

C. Framing Anchors: As manufactured by the Simpson Company, or equal.

D. Building paper: 15# roofing felt.

2.03 WOOD TREATMENT:

A. Where lumber or plywood is indicated as "Treated", or is specified, comply with AWPA Standards C2 (Lumber) and C9 (Plywood) and of AWPB LP2. Treat wood cants, nailers, curbs, blocking, stripping, equipment platforms and similar members in connection with roofing, flashing, vapor barriers and waterproofing. Wood sills, sleepers, blocking, furring, stripping and similar concealed members in contact with masonry or concrete.

B. Fire-Retardant Treatment: Where "FR-S" lumber or plywood is specified, comply with the AWPA standards for pressure impregnation with fire-retardant chemicals to achieve a flame-spread rating of not more then 25 when tested in accordance with UL Test 723, ASTM E 84, or NFPA Test 355.

PART 3 – EXECUTION

3.01 INSTALLATION: Discard units of material with defect which might impair quality of the Work.

A. Provide minimum 2 x 8 wood blocking for mounting of all toilet accessories, sinks, handrails, and other wall mounted items.

B. Comply with recommendations of "Manual for House Framing" of National Forest Products Association. Do not splice structural members between supports.

C. Provide continuous horizontal blocking row at mid-height of single-story partitions over 8’ high and at midpoint of multi-story partitions.

D. Horizontal runs of piping may be installed in notches located no closer than 1” from the face of the stud and the notch bridges over with a #12 U.S. gauge x 12” long metal strap.

E. Installation of Plywood: Comply with Form No. E304, “APA Design/Construction Guide – Residential & Commercial”

F. Fastening Methods:
1. Subflooring: Glue-nail to framing,
2. Underlayment: Nail to subflooring,
3. Roof Sheathing: Nail to framing in accordance with the drawings,
4. Plywood Backing Panels and Equipment Platforms: Nail to supports.

G. Fastener material for “Treated” and “Fire Retardant” lumber shall be as approved by chemical manufacturer.

H. Where plaster is to be installed over plywood, provide 1/8” gap at all plywood joints.

END OF SECTION

(PAGE INTENTIONALLY LEFT BLANK)

SECTION 06 20 00 – FINISH CARPENTRY AND MILLWORK

PART 1 – GENERAL

1.01 Requirements of Division 00 and Division 01 apply to the Work of this Section.

1.02 DESCRIPTION OF WORK: Finish carpentry and millwork which is exposed to view, is non-structural, and which is not specified as part of other sections.

A. Related Documents: Rough Carpentry is specified in Section 06 10 00, Hardware is specified in Section 08 71 00, and Wood Doors is specified in Section 08 14 00.

1.03 SUBMITTALS:

A. Product Data: Submit manufacturer's specifications and installation instructions for each item of factory-fabricated siding and paneling.

B. Wood Treatment Data: Submit chemical treatment manufacturer's instructions for proper use of each type of treated material.

1.04 QUALITY ASSURANCE:

A. Factory-mark each piece of lumber and plywood with type, grade, mill and grading agency identification; except omit marking from surfaces to receive transparent finish.

B. The "Quality Standards" of the Architectural Woodwork Institute are hereby made a part of this specification for interior work only. The Work shall conform to "Custom" grade.

C. Install the Work in this section as specified in the latest edition of Woodwork Institute's Manual of Millwork and provide a Woodwork Institute Certified Compliance Certificate for installation at the completion of the Work.

1.05 PRODUCT DELIVERY, STORAGE AND HANDLING: Protect finish carpentry materials during transmit, delivery, storage and handling. Do not deliver finish carpentry materials, until painting, wet work, grinding and similar operations have been completed.

1.06 JOB CONDITIONS: Do not install finish carpentry until required temperature and relative humidity have been stabilized and will be maintained in installation areas.

PART 2 – PRODUCTS

2.01 WOOD PRODUCT QUALITY STANDARDS:

A. Softwood Lumber Standard: Comply with PS 20.

B. Softwood Plywood Standard: Comply with PS 1.

C. Hardwood Lumber Standard: Comply with National Hardwood Lumber Association (NHLA) rules.

D. Hardwood Plywood Standard: Comply with PS 51.

2.02. MATERIALS: Nominal sizes are indicated, except as shown by detailed dimensions. Provide dressed lumber, as applicable, that is kiln-dried that is within the range of the referenced woodworking standard.

A. Lumber for Transparent Finish: Use pieces made of solid lumber stock.

B. Lumber for Painted Finish: At Contractor's option, use pieces which are glued-up lumber or made of solid lumber stock.

C. Where finish carpentry is exposed on exterior or in areas of high relative humidity, provide fasteners and anchorages with a hot-dipped zinc coating or aluminum alloy.

D. Pre-Finished Plastic Coated Hardboard: 1/4" thick plastic coated as manufactured by Marlite Division of Masonite Corporation or approved equal.

E. Wood to Wood or Hardboard to Wood Adhesive: 3M, No. EC-1233, or approved equal.

F. Plastic Laminate to Wood Adhesive: 3M, No. EC-1368, or approved equal.

G. Standing and Running Trim for Transparent Finish (Contractor's Option): Western Red Cedar or Redwood clear V.G, for boards, and dimensional lumber.

H. T & G Board Siding for Transparent Finish (Contractor's Option): Clear V.G. Western Red Cedar or Redwood S1S2E with re-sawn face, pattern WP4.

I. Plywood for Transparent Finish: 303 Siding, penply plain (ungrooved), roughsawn, exterior 3/8" clear grade, square edge.

J. M.D.O. Plywood for Painted Finish: Any softwood species, Exterior type, Medium Density Overlay (MDO/EXT-APA).

K. (Specifier to include job specific information)

PART 3 – EXECUTION

3.01 PREPARATION: Condition wood materials to average prevailing humidity conditions in installation areas prior to installing.

3.02 INSTALLATION: Shim as required using concealing shims. Install to a tolerance of 1/8" in 8'-0" for plumb and level countertops; and with 1/16" maximum offset in flush adjoining 1/8" maximum offsets in revealed adjoining surfaces. Scribe and cut work to fit adjoining Work.

A. Standing and Running Trim: Install with minimum number of joints possible, using full-length pieces. Stagger joints in adjacent and related members. Use scarf joints for end-to-end joints. Cope at returns and miter at corners.

B. Secure finish carpentry work with countersink, concealed fasteners and blind nailing. Except where pre-finished matching fasteners heads are required, use fine finishing nail for exposed nailings, countersunk and filled flush.

C. Install exterior plywood paneling over #15 asphalt impregnated builder's felt. Lap felt a minimum of 2" horizontally and 6" vertically.

END OF SECTION

(PAGE INTENTIONALLY LEFT BLANK)

SECTION 07 20 00 – BUILDING INSULATION

PART 1 – GENERAL

1.01 Requirements of Division 00 and Division 01 apply to the Work of this Section.

1.02 DESCRIPTION OF WORK: Provide complete insulation system as shown on drawings.

A. Related Documents: Gypsum Drywall is specified in Section 09 29 00, Lath and Plaster is specified in Section 09 24 00, and Rough Carpentry is specified in Section 06 10 00.

1.03 QUALITY ASSURANCE: Comply with fire-resistance, flammability and insurance ratings. Comply with governing regulations as interpreted by authorities.

1.04 PRODUCT HANDLING: Do not allow insulation materials to become wet, soiled, or covered with ice or snow.

PART 2 – PRODUCTS

2.01 MATERIALS:

A. Unfaced Mineral Fiber Blanket/Batt Insulation: Thermal insulation with fibers manufactured from glass or slag. Insulation shall have combustion characteristics which conform to ASTM E 136. Maximum flame spread and smoke developed values shall be 25 and 50, respectively.

B. Faced Mineral Fiber Blanket/Batt Insulation: Thermal insulation with fibers manufactured from glass or slag with a foil-scrim-kraft vapor-retarder membrane on one face. Insulation shall have combustion characteristics which conform to ASTM E 136 for an unfaced blanket/batt. Maximum flame spread and smoke developed values shall be 25 and 50, respectively.

C. Wire for securing batt insulation: 18 gauge, zinc coated.

D. Expanded Polystyrene: Minimum compressive strength of 60 lbs./sq. in. in accordance with ASTM D 1621.

PART 3 – EXECUTION

3.01 INSPECTION: Installer must examine substrate and conditions under which insulation work is to be performed. Do not proceed until satisfactory conditions have been corrected.

3.02 INSTALLATION: Comply with manufacturer's instructions for particular conditions of installation.

A. Extend insulation full thickness as shown over entire area to be installed. Cut and fit tightly around obstructions and fill voids with insulation.

B. Roof Areas: Install unfaced batts in areas where ceilings occur and faced batts where roof structure is exposed. Staple tabs of faced batts as recommended by manufacturer. Secure with wire running perpendicular to structural members at 48" o.c. for faced batts and 12" o.c. at unfaced batts. Staple wire at intersections with structural members. Thermal resistance shall be R-30 unless noted otherwise on drawings or energy calculations.

C. Wall Areas: Install unfaced batts. Where structure is exposed secure with wire at 12" o.c. Staple wire at intersections with structural members. Thermal resistance shall be R-19, except interior building walls where insulation is noted shall be thermal resistance of R-13 unless noted otherwise on drawings or energy calculations.

END OF SECTION

SECTION 07 25 00 - WEATHER BARRIERS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Building paper.
2. Building wrap.
3. Flexible flashing.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

1.3 INFORMATIONAL SUBMITTALS

A. Evaluation Reports: For water-resistive barrier and flexible flashing, from ICC-ES.

PART 2 - PRODUCTS

2.1 WATER-RESISTIVE BARRIER

A. Building Paper: ASTM D 226, Type 1 (No. 15 asphalt-saturated organic felt), unperforated.

B. Building Paper: Water-vapor-permeable, asphalt-saturated kraft building paper.

1. Water vapor transmission not less than 35 g/sq. m x 24 hr per ASTM D 779.
2. Water resistance not less than 1 hour per ASTM F 1249.

C. Building Wrap: ASTM E 1677, Type I air barrier; with flame-spread and smoke-developed indexes of less than 25 and 450, respectively, when tested according to ASTM E 84; UV stabilized; and acceptable to authorities having jurisdiction.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. Dow Chemical Company (The); Styrofoam Weathermate Plus Brand Housewrap.

b. DuPont (E. I. du Pont de Nemours and Company); Tyvek CommercialWrap
c. Ludlow Coated Products; Barricade Building Wrap.
d. Pactiv, Inc.; GreenGuard Ultra Wrap.
e. Raven Industries Inc.; Fortress Pro Weather Protective Barrier.
f. Reemay, Inc.; Typar HouseWrap.

2. Water-Vapor Permeance: Not less than 50g through 1 sq. m of surface in 24 hours per ASTM E 96/E 96M, Desiccant Method (Procedure A).

D. Building-Wrap Tape: Pressure-sensitive plastic tape recommended by building-wrap manufacturer for sealing joints and penetrations in building wrap.

2.2 MISCELLANEOUS MATERIALS

A. Flexible Flashing: Self-adhesive butyl rubber or rubberized-asphalt] compound, bonded to a high-density polyethylene film, aluminum foil, or spunbonded polyolefin to produce an overall thickness of not less than 0.025 inch.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. DuPont (E. I. du Pont de Nemours and Company); DuPont Flashing Tape.
b. Grace Construction Products, a unit of W. R. Grace & Co. - Conn.; Vycor Butyl Self Adhered Flashing.
c. Protecto Wrap Company; BT-25 XL.
d. Raven Industries Inc.; Fortress Flashshield.
e. Advanced Building Products Inc.; Wind-o-wrap.
f. Carlisle Coatings & Waterproofing; CCW-705-TWF Thru-Wall Flashing.
g. Fiberweb, Clark Hammerbeam Corp.; Aquaflash 500.
h. Grace Construction Products, a unit of W. R. Grace & Co. - Conn.; Self-Adhered Flashing.
i. MFM Building Products Corp.; Window Wrap.
j. Sandell Manufacturing Co., Inc.; Presto-Seal.

PART 3 - EXECUTION

3.1 WATER-RESISTIVE BARRIER INSTALLATION

A. Cover sheathing with water-resistive barrier as follows:

1. Cut back barrier 1/2 inch on each side of the break in supporting members at expansion- or control-joint locations.
2. Apply barrier to cover vertical flashing with a minimum 4-inch overlap unless otherwise indicated.

B. Building Paper: Apply horizontally with a 2-inch overlap and a 6-inch end lap; fasten to sheathing with galvanized staples or roofing nails.

C. Building Wrap: Comply with manufacturer's written instructions.

1. Seal seams, edges, fasteners, and penetrations with tape.
2. Extend into jambs of openings and seal corners with tape.

3.2 FLEXIBLE FLASHING INSTALLATION

A. Apply flexible flashing where indicated to comply with manufacturer's written instructions.

1. Lap seams and junctures with other materials at least 4 inches except that at flashing flanges of other construction, laps need not exceed flange width.
2. Lap flashing over water-resistive barrier at bottom and sides of openings.
3. Lap water-resistive barrier over flashing at heads of openings.

END OF SECTION 072500

(PAGE INTENTIONALLY LEFT BLANK)

SECTION 07 32 19 – METAL ROOFING

PART 1 – GENERAL

1.01 Requirements of Division 00 and Division 01 apply to the Work of this Section.

1.02 DESCRIPTION OF WORK: Provide a complete metal roofing system as indicated on the drawings.

A. Related Documents: Flashing and Sheet Metal is specified in section 07 60 00.

1.03 SUBMITTALS:

A. Samples: Submit samples of metal roofing with specified finish.

B. Job Site Mock-up Samples: Upon review and acceptance of samples by the Architects, the Contractor shall prepare job site mock-up as specified in 1.04 Quality Assurance.

1.04 QUALITY ASSURANCE:

A. Conform the Work to details shown, and to applicable fabrication requirements of "Architectural Sheet Metal Manual" by SMACNA. Comply with installation details of "Roofing and Waterproofing manual" by NRCA.

B. Job Site Mock-up: The Contractor shall prepare 4' x 8' sample roof panel mock-up using actual materials and finishes required for final work for Owner's review and approval. The mock-ups shall be prepared concurrently with all other mock-ups and obtain the approval from the Owner prior to ordering any material for the project.

1.05 PROJECT CONDITIONS: Coordinate the Work with interfacing and adjoining Work.

1.06 SPECIAL PROJECT GUARANTEE: Provide a two year weather tightness guarantee and a 20 year finish warranty.

PART 2 – PRODUCTS

2.01 MANUFACTURES: AEP Span or approved equal.

2.02 MATERIALS:

A. Metal Panels: (10", 12", 18", 24") wide, (22-gauge steel, 24-gauge steel, 16 ounce, ¾ hard copper) (SN snap-seam edge, snap-seam structural batten system), with Kynar 500 70% resin finish from manufacturer's standard colors.

B. Solder: For use with steel or copper, provide 50-50 tin/lead solder, ASTM B 32, with rosin flux.

C. Fasteners: Same metal as flashing/sheet metal or other non-corrosive metal. Match finish, type and size of exposed heads with material being fastened.
1. (Snap-Seam Clip, Snap-Seam Structural Batten Clip): Manufacturer's standard clip. Install at spacing as directed by manufacturer.
2. Sheetmetal to wood: Screws shall be No. 8 minimum and shall penetrate wood blocking minimum 1.5 inches.
3. Sheetmetal to sheetmetal: Self-tapping sheet metal screws of ½" length and a minimum of No. 3 diameter.
4. Sheetmetal to masonry: "Tapcon" threaded anchors, 3/16" minimum diameter, length to penetrate masonry a minimum of 1.5", manufactured by Buildex, a division of Illinois Tool Works, Inc., or approved equal.

D. Bituminous Coating: FS TT-C-494 or SSPC-Paint 12, solvent type bituminous mastic, nominally free of sulfur, compounded for 15-mil dry film thickness per coat.

E. Mastic Sealant: Polyisobutylene; non-hardening, non-skinning, non-drying, non-migrating sealant.

F. Elastomeric Sealant: Generic type recommended by manufacturer; comply with FS TT-S-0027, TT-S-00230, or TT-S-001543.

G. Elastic Flashing Filler: Closed-cell polyethylene.

H. Plastic Roofing Cement: ASTM D 2822, asphaltic.

2.03 METAL FABRICATION: Shop-fabricate work to greatest extend possible. Comply with details shown, and with applicable requirements of SMACNA "Architectural Sheet Metal Manual".

A. Separations: Provide for separation of metal from non-compatible metal or corrosive substrates.

2.04 HANDLING: Store and handle metal roofing according to manufacturer's recommendations. Protect prefinished material from scratchings, dents and gouges. Store materials out of sunlight.

PART 3 – EXECUTION

3.01 INSTALLATION REQUIREMENTS: Except as otherwise indicated, comply with manufacturer's installation instructions and recommendations, and with SMACNA "Architectural Sheet Metal Manual".

A. Felt Underlayment: Lay parallel to eaves, lap 2-1/2" horizontally and 6" vertically. Nail 6" on centers and extend felt 6" up walls.

3.02 CLEANING AND PROTECTION: Clean exposed surfaces, removing substances which might cause corrosion of metal or deterioration of finishes. Do not allow traffic on completed roof unless panels are protected by walk boards.

END OF SECTION

(PAGE INTENTIONALLY LEFT BLANK)

SECTION 07 44 56 – MINERAL FIBER REINFORCED CEMENTITIOUS PANELS

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Fiber cement panels of the following types:
   1. Surface colored high density fiber cement panels

1.2 RELATED SECTIONS

A. Section 05 40 00 - Cold-Formed Metal Framing.

B. Section 06 01 10 - Rough Carpentry.

C. Section 07 25 00 - Weather Barriers.

1.3 REFERENCES

A. ASTM International (ASTM):
   1. ASTM C 1185 - Standard Test Methods for Sampling and Testing Non-Asbestos Fiber-Cement Flat Sheet, Roofing and Siding Shingles, and Clapboards.
   2. ASTM C 1186 - Standard Specification for Flat Fiber-Cement Sheets.
   3. ASTM E 84 - Surface Burning Characteristics of Building Materials.
   4. ASTM E 136 - Standard Test Method for Behavior of Materials in a Vertical Tube Furnace at 750 degree C.

1.4 SUBMITTALS

A. Product Data: Manufacturer's data sheets on each product to be used, including:
   1. Preparation instructions and recommendations.
   2. Storage and handling requirements and recommendations.
   3. Installation methods.

B. Shop Drawings: Provide detailed drawings of non-standard applications of fiber cement materials which are outside the scope of the standard details and specifications provided by the manufacturer.

C. Attachment System Engineered Drawings:
   1. Provide engineered design for attachment and back-up framing to support exterior cladding.
   2. Provide static calculations verifying sizing of members, attachment devices and fasteners to support the exterior cladding with a safety factor required by Authority Having Jurisdiction (AHJ).
   3. Provide Installation drawings and details.

4. Manufacturer's Certificates: Certify materials and accessory component products meet or exceed specified requirements.
5. Manufacturer's warranties. Executed by manufacturer and installer.

D. Selection Samples: For each finish product specified, two complete sets of color chips representing manufacturer's full range of available colors and patterns.

E. Verification Samples: For each finish product specified, two samples, minimum size 6 inches square, representing actual product, color, and patterns.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: Minimum of 2 years experience with installation of similar products.

B. Color Evaluation: Insignificant change after 3000 hours of QUV test (EN 20105).

C. Mock-Up: Provide a mock-up for evaluation of surface preparation techniques and application workmanship.
1. Finish areas designated by Architect.
2. Do not proceed with remaining work until workmanship, color, and sheen are approved by Architect.
3. Remodel mock-up area as required to produce acceptable work.

1.6 FABRICATION, DELIVERY, STORAGE, AND HANDLING

A. D not deliver cement panels to site until job is ready for their installation.

B. Store products in manufacturer's unopened packaging until ready for installation in accordance with manufacturer's recommended guidelines.

C. Store materials off the ground, flat and under cover in a dry place until erection, keep dry and protect from freezing.

1.7 PROJECT CONDITIONS

A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's recommended limits.

1.8 WARRANTY

A. Warranty: Manufacturer warrants that its products are manufactured in accordance with its applicable material specifications and are free from defects in materials and workmanship. Materials shall carry a minimum

5 year manufacturer's warranty.

1. Only products that are installed and used in accordance with applicable manufacturer's instructions and specifications are warranted.
2. The warranty is applicable only to claims made in writing and received by the manufacturer within thirty days after the defect was discovered and within ten years after the date of the shipment of the product by the manufacturer.

PART 2 PRODUCTS

2.1 MANUFACTURER/SUPPLIER

A. Basis of Design: Hardie Plank® Lap Siding, Select Cedarmill by James Hardie, size: 7.25" width, .315" thickness, 144" length, primed and ready for paint finish.

B. Substitutions: Comparable manufacturer of equal or better quality.

C. Requests for substitutions will be considered in accordance with provisions of project substitution requirements.

2.2 MATERIALS

A. Prefinished Cement Board Siding Panels: SILBONIT siding sheets, fiber reinforced, cement based product conforming to ASTM C 1186 and manufactured of cement sand, cellulose fibers and fillers.

B. Mechanical fasteners: External tamper proof screws, stainless steel, torx head fasteners.
   i. Screws shall be length as required by the panel manufacturer for the furring material used.
   ii. Wood screws: Size: #10 by 1-1/2 inch (38 mm).
   iii. Steel Screws: Size: #12 by 1-1/8 inch (29 mm).
   iv. Use painted screws to match panel finish.

C. Continuous cushions of black EPDM rubber, 1-1/4 inch and 3-1/2 inch as required.

2.3 ACCESSORIES

A. Trim: PVC, composite and stainless steel trim shapes suitable for trim conditions.

B. Sheet Metal Flashing: Minimum 26 gauge hot-dipped galvanized steel sheet, or stainless steel.

C. Wood furring materials shall conform to the requirements specified is Section 06 10 00 - Rough Carpentry.

D. Rigid insulation between furring channels shall comply with Section 07 20 00 – Building Insulation.

PART 3 EXECUTION

3.1 EXAMINATION

A. Do not begin installation until substrates have been properly prepared.

B. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.2 PREPARATION

A. Clean surfaces thoroughly prior to installation.

B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

C. Ensure that all dust, dirt, fingerprints and all other foreign marks on the material are removed prior to installation of the panels.

3.3 INSTALLATION

A. Install in accordance with manufacturer's instructions and approved submittals.

B. For exterior applications, comply with local codes and structural engineer's fastening calculations along with manufacturer's recommendations for fastener spacing.

C. Prepare structural backing with studs, backer board, weather barrier and furring as required to meet the performance requirements specified. Install fiber reinforced panels over a properly prepared support system in accordance with the manufacturer's installation instructions and approved shop drawings.

D. Install weather barrier over prepared substrate.

E. Fiber reinforced cement panel siding shall be installed over an impervious weather barrier, on furring strips with black EPDM rubber strips, and with an air cavity behind the face panel to allow ventilation of the substrate.

F. Panels shall be attached to furring using the attachment pattern and

fasteners indicated in the manufacturer's installation instructions and approved shop drawings.

G. Install black EPDM rubber strips to each furring member.

H. Pre-drill holes in cement boards in pattern indicated in the manufacturers installation instructions and approved shop drawings. Holes shall be of size as specified by the panel manufacturer for the fasteners being used.

I. Fasten fiber cement board to furring as per vendor's details with approved stainless steel fasteners.

3.4 EXTERIOR CLADDING FOR RAINSCREEN APPLICATIONS

A. Detailing Requirements:
   1. Air space at top and bottom of building or wall termination shall be 3/4 inch (20 mm) to facilitate airflow from behind the panels. Do not block vertical airflow at windows, doors, eaves, or at the base of the building. Airflow shall be continuous from bottom to top so there is air movement behind each panel. For walls over 60 feet high (18 m), the ventilated cavity between rear of panels and exterior wall shall be increased to 1-5/8 inches (40 mm). Air flow behind the cement fiber panels is critical to the performance of the rain screen constructions.
   2. Fasteners in profile shall accommodate thermal expansion/contraction of metal and not interfere with panel application.
   3. Install panels from top of building to bottom.
   4. For straight walls, start panel installation in center and work outward.
   5. For walls with inside corners, start installation at corner and work across wall.
   6. Pattern: Straight pattern with vertical panels. Panel size as indicated.
   7. Pattern: Straight pattern with horizontal panels. Panel size as indicated.
   8. Pattern: Semi pattern with horizontal panels. Panel size as indicated.

B. Rain Screen Installation: Comply with manufacturer's installation requirements.
   1. Attachment System: Comply with manufacturer's engineered design for cladding support framing.

3.5 PROTECTION

A. Protect installed products until completion of project.

B. Inspect walls for any damage. Replace panels that are damaged. Do not attempt to repair.

C. Ensure all dirt, dust, fingerprints and all foreign marks are immediately removed from the face of the material to avoid from permanent damage.

D. Replace damaged products before Substantial Completion.

END OF SECTION – 07 44 56

SECTION 07 51 01 – ROOF GUARANTEE AND MAINTENANCE AGREEMENT

OWNER: _____
Address: _____
Phone: _____

GENERAL CONTRACTOR: _____
Address: _____
Phone: _____

ROOFING CONTRACTOR: _____
Address: _____
Phone: _____

DATE OF PROJECT COMPLETION: _____

The Roofing Contractor represents to the Owner and the General Contractor that the roof system has been installed according to the specifications. The Roofing Contractor agrees to make immediate emergency repairs as required to stop leaks and/or correct defects in the roofing system (both Built-up and Steep) within twenty-four hours of notice received from the Owner for the project listed above and in accordance with the conditions listed below. This agreement shall be in effect for two (2) full years from the date of project completion.

The General Contractor represents to the Owner that the roof system has been installed according to the specifications. The General Contractor agrees to make immediate emergency repairs or cause to make immediate repairs as required to stop leaks and/or correct defects in the roofing system (both Built-up and Steep) within twenty-four hours of notice received from the Owner for the project listed above and in accordance with the conditions listed below. This agreement shall be in effect for two (2) full years from the date of project completion.

We, the undersigned agree:

A. To make such permanent repairs as may be required without reference to or consideration of the course or nature of such leaks or defects in the Work.

B. That Work required will be completed without cost to the Owner, unless the Work is required due to the acts of God, abuse, alterations, or failure to the substrate and/or supporting structure.

C. That this agreement and the enforcement of its provisions shall not deprive the Owner of any action, right, or remedy otherwise available to him.

D. That repair work completed at the Owner's expense shall be invoiced to the Owner at prevailing rates and shall include an itemized breakdown of quantities and unit costs for

labor and materials, and shall include not more than fifteen percent (15%) markup for overhead and profit.

IN WITNESS WHEREOF, this instrument has been duly executed.

this_____ day of_____, 20___.

By:_____, Title_____.
(Authorized Agent of General Contractor).

IN WITNESS WHEREOF, this instrument has been duly executed.

this_____ day of_____, 20___.

By:_____, Title_____.
(Authorized Agent of Roofing Contractor).

END OF SECTION

SECTION 07 54 23 – THERMOPLASTIC POLYOLEFIN (TPO) ROOFING SYSTEM

PART 1 – GENERAL

1.01 Requirements of Division 00 and Division 01 apply to the Work of this Section.

1.02 DESCRIPTION OF WORK: Provide complete weather tight Single-Ply Thermoplastic Roofing System as follows:

Consisting of 60 mil min. TPO membrane over ¼" gypsum cover board over wood deck, or 60 mil min. TPO membrane over ¼" high density coverboard over 2 layers of insulation boards over metal deck as indicated on the Drawings.

A. Related Documents: Sheet metal flashing is specified in Section 07 60 00 and Roof Accessories is specified in Section 07 72 00.

1.03 SUBMITTALS:

A. Submittals Package – General
   1. Submit the Product Data, Samples, and Quality Control Submittals specified below at the same time as a package.
   2. All submittal packages must be submitted prior to the Pre-Installation conference.

B. Product Data
   1. Catalog sheets, Specifications and installation instructions for each material specified.
   2. Submit an intent to warrant, executed by authorized representative of system manufacturer, indicating that manufacturer has reviewed drawings, specifications and conditions affecting the work and proposes to provide warranties as referenced herein without further stipulation.
   3. Manufacturer's Warranty: Submit a sample copy of the membrane manufacturer's warranty covering workmanship and materials.

C. Samples
   1. All submitted samples must be labeled and supplied by manufacturer:
      a. Roofing Membrane: One each type
      b. Cover board: One each type
      c. Insulation board: One each type
      d. Fasteners: Three each type

1.04 REFERENCE STANDARDS:

A. References and industry standards listed in this Section are applicable to the Work. Unless more restrictive criteria or differing requirements are explicitly stated in the Specifications, or mandated governing codes or regulations, the

recommendations, suggestions, and requirements described in the referenced standards are deemed mandatory and applicable to the Work.

B. ASTM: American Society for Testing and Materials, Philadelphia, PA

C. NRCA: National Roofing Contractors Association, Rosemont, IL

D. FM: Factory Mutual Engineering and Research, Norwood, MA

E. UL: Underwriters Laboratories, Inc., Northbrook, IL

F. SMACNA: Sheet Metal and Air Conditioning National Contractor's Association, Chantilly, Virginia

G. OSHA: Occupational Safety and Health Administration, Washington, DC

H. SPRI: Single Ply Roofing Industry, Waltham, MA

1.05 DEFINITIONS:

A. Roofing Terminology: Refer to ASTM D 1079 "Terminology relating to Roofing and Waterproofing"; glossary of NRCA's "The NRCA Roofing and Waterproofing Manual"; and the Roof Consultants Institute Glossary of Roofing terms for definition of terms related to roofing Work in this Section.

B. Sheet Metal Terminology and Techniques: SMACNA Architectural Sheet Metal Manual.

1.06 PERFORMANCE REQUIREMENTS:

A. General: Provide installed roofing membrane and base flashings that remain watertight; do not permit the passage of water; and resist specified uplift pressures, thermally induced movement, and exposure to weather without failure.

B. Material Compatibility: Provide roofing materials that are compatible with one another under conditions of service and application required, as demonstrated by roofing membrane manufacturer based on testing and field experience.

C. Jobsite Safety: Execute all operations and provide a safe work environment in accordance to OSHA standards and regulations. This requirement applies to all contractor personnel, associated subcontractors, workers in other trades, and jobsite visitors.
   1. Follow all industry fire prevention guidelines for storage of materials, staging area, roof access, and application means and methods.
   2. Any applicable local fire codes supersede industry guidelines.

D. Roofing System Design: Provide membrane roofing that is identical to systems that have been successfully tested by a qualified testing and inspecting agency to resist uplift pressure calculated according to ASCE 7-02.

E. FMG Listing: Provide roofing membrane, base flashings, and component materials that comply with requirements in FMG 4450 and/or FMG 4470 as part of a membrane roofing system and that are listed in FMG's "RoofNav" for Class 1 for noncombustible construction and Class A for exterior fire rating, as applicable. Identify materials with FMG markings.

F. UL Listing: Provide membrane roofing materials with the fire-test-response characteristics indicated as determined by testing identical products per test methods mandated by UL. Identify materials with appropriate markings of applicable testing and inspecting agency.

1.07 QUALITY ASSURANCE:

A. Quality Control Submittals
   1. Test Reports:
      a. Roof flood test

B. Certifications
   1. Provide letter from the roofing membrane manufacturer certifying the proposed roofing assembly, compatibility of materials and total R-value of the insulation system.

C. Membrane Manufacturers Certifications:
   1. Roofing system manufacturer must provide inspection of guaranteed roofing systems by company employed, salaried, personnel dedicated to Technical Services.
      a. Sales representatives or sales agents will not be permitted to conduct quality assurance inspections or grant final manufacturer's acceptance.

D. Contractor's Certification:
   1. Provide a letter from the membrane manufacturer certifying that the applicator is licensed or approved to install the roof system.
   2. Provide names, addresses, and telephone numbers of five buildings where the applicator has installed similar roof systems that have the manufacturer's guarantee issued. Include the types of systems installed, the manufacturer's name, and the guarantee numbers.
   3. Letter certifying that the job foreman or crew chief and at least one other member of the roofing crew have installed at least similar systems and are thoroughly familiar with all aspects of the installation.

E. Contractor's Qualifications:

1. Roofing Firm Qualifications
   a. Installation of a minimum of ten roofs of comparable size, scope, and complexity as the roofing system specified in the Contract Documents, including all related sheet metal work, if applicable. (List last five such jobs within 100 miles of the job site, including address, type of system and number of plies, if applicable, square footage, date installed and owner/agent with whom contracted).
2. Project Foreman Qualifications:
   a. Installation of a minimum of five roofs of comparable size, scope, and complexity as the Work of this Section of roofing system specified in the Contract Documents, for which this individual served as field foreman in direct, responsible charge of all roofing work crews. (List last five such jobs within 100 miles of the job site, including address, type of system and number of plies, if applicable, square footage, date installed and owner/agent with whom contracted).
   b. Successful completion of a formal instructional and training program for the installation of the specified roofing systems, as evidenced by one of the following:
      1) A certificate of journeyman roofer as issued under a union apprenticeship-journeyman training program duly registered with the State Labor Department; or
      2) A certificate or diploma issued by a vocational training school or national roofing manufacturer attesting to successful completion of an equivalent formal training program, (Submit copy of certificate for above); or
      3) A minimum of five years of practical experience in the installation of all aspects and details of the specified roofing system(s) including related sheet metal work as determined from a pre-qualification interview.

F. Preliminary Roofing Conference:
1. Before starting roof deck construction, conduct conference at Project site. Review methods and procedures related to roof deck construction and roofing system including, but not limited to, the following:
   a. Meet with Owner, Owner’s Representative, Owner's insurer (if applicable), testing and inspecting agency representative, roofing installer, roofing system manufacturer's representative, deck installer, and installers whose work interfaces with or affects roofing including installers of roof accessories and roof-mounted equipment.
   b. Review means, methods, and procedures related to roofing installation, including manufacturer's written instructions.
   c. Review Project Safety Plan for site conditions, enforcement, compliance, or Owner imposed restrictions that may be required.

d. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
e. Examine site for approved staging areas, disposal sites, and document existing conditions prior to contractor mobilization. Establish scope of work for site restoration and responsibilities.
f. Examine site for condition and completion of areas adjacent to work area. Establish protection required for existing surfaces.
g. Examine deck substrate conditions and finishes for compliance with requirements, including flatness and fastening.
h. Review structural loading limitations of roof deck during and after roofing operations.
i. Review base flashings, special roofing details, roof drainage, roof penetrations, equipment curbs, and condition of other construction roofing system.
j. Review governing regulations and requirements for insurance and certificates if applicable.
k. Review temporary protection requirements for roofing system during and after installation.
l. Review work limitation by contractor including; start times, end times, days of the week, noise mitigation, fume control and any part of the work that would effect normal building operations.
m. Review trade coordination necessary for job completion.
n. Review roof observation and repair procedures after roofing installation.

1.08 DELIVERY, STORAGE, HANDLING AND DISPOSAL:

A. Delivery:
1. Deliver roofing materials to the site in the manufacturer’s unbroken containers bearing the manufacturer’s labels.

B. Storage and Handling:
1. Rooftop storage will be permitted only with the authorization of an engineer.
2. Store materials a minimum of 6” off the ground, in a dry, well ventilated place protected from the weather.
a. Enclosed trailers are recommended.
b. Temperature conditioned storage is required for temperature sensitive items.
3. Mark for clear and evident identification all material that has been subject to moisture.
a. Remove such materials from the site.
4. Handle roll goods with care.
a. Do not use roll goods which have been damaged.
b. Leave materials in their packaging until ready for use.
5. Allow no unlabeled materials on site.

6. In event of damage, immediately make all repairs and replacements required by Owner's Representative.

C. Disposal:
1. All removed materials become the property of the contractor.
2. Inspect ground areas surrounding roof on a daily basis for loose debris.
3. Immediately move all debris off roof and into approved dumpster.
4. Dumpster staging areas must be kept neat and tidy.
   a. Do not allow to overflow.
5. All debris must be transported to a legal dumpsite or recycling facility and documentation of each load must be maintained by the Contractor.

1.09 PROJECT CONDITIONS:

A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit roofing system to be installed according to Manufacturer's written instructions and guarantee requirements.
1. Do not start roofing if rain is imminent, or ambient temperature is below 45°F.
2. If rain occurs during roof membrane application, cease operations and protect deck, insulation, penetrations and membrane from water damage and intrusion.

B. Comply with all fire regulations. Ensure properly rated, charged, and inspected fire extinguishers are on the roof and staging area.

1.10 SUBSTITUTION:

A. When a particular make or trade name is specified, it is indicative the standard required. The basis of this specification is Johns Manville, any bid complying with this spec is relieved from all further product submittals.

B. For bidders proposing substitutes, submit the following ten (10) days prior to bid date to Owner's Representative:
1. Written request with explanation of why substitute product should be considered.
2. Manufacturer's literature and samples of requested substitutions.
3. Three (3) job references available for inspections within hundred (100) miles of Owner's Representative where substitutes were used under similar conditions.
4. Any methods or procedures that differ from this specification.

C. Only substitutes approved in writing by Owner/Owner's Representative prior to scheduled bid date will be considered.

1.11 SPECIAL PROJECT WARRANTY:

A. Manufacturer's Guarantee, without monetary limitation, includes materials and workmanship to maintain roof in a watertight condition.
   1. Provide guarantee including membrane, insulation, fasteners, membrane flashings, and walkway pads.
   2. Include expansion joint covers, liquid applied flashing, and metal edge products supplied by the manufacturer.

B. Provide manufacturer's system guarantee equal to Johns Manville's Fifteen (15) Year Peak Advantage No Dollar Limit Roofing System Guarantee. Guarantee to run from date of substantial completion. Manufacturer shall have a minimum AAA credit rating.

C. Applicator's Guarantee:
   1. Special Project Warranty: Submit roofing Installer's warranty, signed by Installer, covering Work of this Section, including all components of membrane roofing system such as roofing membrane, base flashing, roof insulation, fasteners, cover boards, substrate boards, and walkway products for a period of 2 years.

PART 2 – PRODUCTS

2.01 MANUFACTURERS:

A. In other Part 2 articles where titles below introduce lists, the following requirements apply for product selection:
   1. Products: Subject to compliance with requirements, provide one of the products specified.
   2. Manufacturers: Subject to compliance with requirements, provide products by the manufacturers specified:
      a. Johns Manville

2.02 MATERIALS:

A. Barrier Layer (for wood deck application)
   1. Thermal Barrier
      a. A non-structural, glass mat faced gypsum panel with a water-resistant core.
      b. Product
         1) Dens Deck
      c. Typical Physical Properties
         1) Thickness: ¼ inch
         2) Width: 4 feet
         3) Length: [4 feet] [8 feet]
         4) Weight: 1.1 psf.
         5) Surfacing: Glass mat
         6) Flexural Strength, Parallel (ASTM C473): 40 lbf, minimum
         7) Flute Span (ASTM E661): 2-5/8 inches, if applicable

8) Permeance (ASTM E96): Not more than 50 perms
9) R-Value (ASTM C518): Not less than 0.28
10) Water Absorption (ASTM C1177): Less than 10 percent of weight
11) Compressive Strength (Applicable Sections of ASTM C472): 500-900 pounds per square inch.

2. Thermal Protective Layer Securement
   a. Mechanical

B. Thermal Layer (for metal deck application)
1. General: Provide preformed roof insulation boards that comply with requirements and referenced standards, selected from manufacturer's standard sizes and of thicknesses indicated.
2. Polyisocyanurate (2 layers)
   a. A rigid roof insulation board composed of a closed cell polyisocyanurate foam core bonded in the manufacturing process to universal fiber glass reinforced facers. Provide product that utilizes an environmentally compliant blowing agent containing pentane hydrocarbon to enhance the thermal performance of the foam insulation. This hydrocarbon has zero ozone depletion potential and conforms to the Montreal Protocol established in 1987.
   b. Reference Standard:
      1) ASTM C 1289-02 Type II, Class I, Grade 2
      2) CAN/ULC S 704
   c. Product:
      1) 2 layers of 2.5” ENRGY 3
   d. Typical Physical Properties
      1) ASTM C 209, Water Absorption: <1.5% (maximum)
      2) ASTM D 2126, Dimensional Stability Change: <2%
      3) ASTM D 1621, Compression Resistance (10% Consolidation): 20 psi (138 kPa) min
      4) ASTM E 96, Moisture Vapor Permeance: <1 perm (57.5 ng/(Pa•s•m2))
      5) Service Temperature: 100º to 250°F (-73° to 121°C)
      6) ASTM D 1623, Tensile Strength: 730 psf (35 kPa) nominal
3. Thermal Protective Layer
   a. High Density Polyisocyanurate
      1) High-density polyisocyanurate technology bonded in-line to mineral-surfaced, fiber glass reinforced facers.
      2) Product
         i) Invinsa
      3) Typical Physical Properties
         i) Thickness: 1/4 inch (6.4 mm), nominal
         ii) Width: 4 feet (1.22 m)
         iii) Length: 4 feet (1.22 m), standard

iv) ASTM D 1037, Flexural Strength: 2000 psi , 28 lbf (13,790 kPa, 4.9 kN/m)
v) ASTM D 2126, Dimensional Stability: <0.6 %
vi) ASTM E 96 Moisture Vapor Permeance: <1 perm [57.5 ng/(Pa•s•m2)]
vii) ASTM C 518: R-Value 1.0 (hr•ft2•ºF)/Btu (0.18 (m2•ºC)/W)
viii) ASTM C 209, Water Absorption: 2.6 % maximum
ix) ASTM D 1621 Compressive Strength: 150 psi, 21,600 psf (1034 kPa, 1,034,200 Pa) minimum
x) ASTM C 473, Surface Water Absorption: <1 gram
xi) ASTM D 3273, Mold Resistance: Pass

4. Thermal Protective Layer Securement
   a. Mechanical
      1) #12 Phillips or hex head fasteners with a special thread and corrosion-resistant coating, exceeding FM Global Approval Standard #4470 corrosion requirements. Provide with either a #3 Phillips head or a 1/4" hex head, a point designed for quick installation and 3" round, premium Galvalume metal plates.
      2) Reference Standard
         i) FM Global Approval Standard #4470
      3) Product
         i) UltraFast ASAP Pre-Assembled Fasteners

C. Membrane Layer
   1. TPO
      a. Thermoplastic polyolefin (TPO) membrane reinforced with a polyester fabric.
      b. Reference Standard:
         1) ASTM D 6878
      c. Product:
         1) TPO-1 60
         2) Color: White
      d. Typical Physical Properties
         1) Energy and the Environment
            i) ENERGY STAR (White Membrane) Reflectivity: Pass
            ii) Reflectivity: 0.76
            iii) Title 24 (White Membrane) Reflectivity: Pass
            iv) Reflectivity: 0.76
            v) ASTM C 1371, Emissivity: 0.90
            vi) LEED (White Membrane) Reflectivity: Pass
            vii) Reflectivity: 0.76
            viii) ASTM E 408, Emissivity: 0.90
         2) ASTM D 751, Weight: 0.290 lb/ sq ft
         3) ASTM D 751, Thickness: 0.060 in. (1.52 mm)

4) ASTM D 751, Tolerance on Nominal Thickness: +/- 10%
5) ASTM D 6778 Annex A, Thickness over scrim, 0.025 in. (.0.64mm)
6) ASTM D 751 Breaking Strength Grab Method, Min
   i) Machine Direction: 320 lbf (1,423.36 N)
   ii) Cross Machine Direction: 270 lbf (1,200.96 N)
7) ASTM D 751, Factory Seam Strength, Cross Machine Direction: 110 lbf (489 N)
8) ASTM D 751, Elongation at Break: 28%
9) ASTM D 751, Tearing Strength, Min
   i) Machine Direction: 70 lbf (311 N)
   ii) Cross Machine Direction: 150 lbf (667 N)
10) ASTM D 2137, Brittleness Point, Max.: Pass
11) ASTM D 1149, Ozone Resistance, No visible cracks: Pass
12) ASTM D 573, Heat Aging, 90% Retention of Breaking Strength and Elongation at Break: Pass
13) ASTM D 471, Water Absorption, Max: 0.7 Mass %
14) ASTM E 96, Water Vapor Permeance: 0.01 Perms
15) ASTM D 751 Hydrostatic Resistance: 430 psi
16) ASTM D 1204, Linear Dimensional Change, Max: 0.4%
17) FTM 101C Method 2031, Puncture Resistance: 380 lb

2. Membrane Layer Securement
   a. Mechanical
      1) #15 fasteners with #3 Phillips head, corrosion-resistant coating, exceeding FM Global Approval Standard #4470 corrosion requirements, a self-tapping drill point designed for quick installation and 2-3/8” round, 20 gauge galvanized steel disks.
      2) Reference Standard
         i) FM Global Approval Standard #4470
      3) Product
         i) High Load Fastener and Plate

D. Installation Accessories
   1. Detail Membrane
      a. A non-reinforced thermoplastic polyolefin membrane for use in detail work.
      b. Product
         1) JM TPO Detail Membrane
   2. Cover Tape
      a. A 5 inch wide, 60 mil TPO membrane with a factory-applied peel & stick tape adhesive and various accessories.
      b. Product
         1) The JM TPO Cover Tape Kit
   3. Clad Metal
      a. A laminate of JM TPO membrane and galvanized steel.
      b. Product

1) JM TPO Coated Metal

4. Manufacturer Pre-Molded Flashings
   a. Inside Corners
      1) A pre-molded inside corner manufactured with a non-reinforced TPO membrane.
      2) Product
         i) JM TPO Universal Corner
   b. Outside Corners
      1) A pre-molded outside corner manufactured with a non-reinforced TPO membrane.
      2) Product
         i) JM TPO Universal Corner
5. TPO Walk Pad
   a. A textured thermoplastic sheet used to protect the roofing membrane system in areas with high rooftop traffic and around rooftop units that require regular maintenance.
   b. Product
      1) JM TPO Walkpad
   c. Typical Physical Properties
      1) Color: Grey
      2) Weight: 100 lbs. (45.4 kgs.) per roll
      3) Dimensions: 30 inches wide x 60 feet long x 5⁄32 inches thick (750 mm x 18.3 m x 4 mm)
      4) Tear Resistance (Die "C"): 100 lbs. (445 N)
      5) Gross Coverage: 150 sq. ft. (13.9 sq. meters) per roll
6. Drains
   a. A roof drain system with flexible bellows that connects to the building plumbing system with no hub connectors.

PART 3 - EXECUTION

3.01 EXAMINATION:

A. Verify that Work of other trades which penetrates the roof deck or requires personnel and equipment to traverse the roof deck has been completed.

B. Examine surfaces for inadequate anchorage, foreign material, moisture, and unevenness that would prevent the execution, and quality of application, or the roofing system as specified.
   1. Do not proceed with application of roofing system until defects are corrected.

3.02 PREPARATION:

A. Surface Preparation:
   1. Inspect wood deck closely for:
      a. Proper securement of panels to joists

b. Proper space between panels
c. Damaged panels
d. Delamination
e. Warping or rotting

2. Inspect metal deck closely for:
   a. Proper securement of panels to joists with no loose decking
   b. Differential deflection at side or end laps
   c. Side lap fasteners in place
   d. Damaged panels
   e. Corrosion
3. Unacceptable panels should be brought to the attention of the General Project Owner's Representative and must be corrected prior to installation of roofing system.
4. Examine underside of deck to ensure all joints are blocked for wood deck.
5. Insure that wood blocking has been installed at perimeter and as required by the drawings, specifications and primary roofing manufacturer.
6. Make sure that all counterflashing receivers, curbs, etc., are constructed in such a manner as to provide a minimum 8-inch base flashing height measured from the finished roof's surface to the top of the base flashing membrane.

3.03 INSTALLING THERMAL PROTECTIVE LAYER (for metal deck):

A. Initial layer
1. Starting at the low edge of the roof, loose lay thermal layer board.
   a. Install boards with long joints continuous.
      1) Install with long joints running parallel to the decking.
   b. Stagger short joints.
   c. Butt joints tightly.
      1) "Occasional" joint widths up to 1/8" will be allowed. Fill all any widths greater than 1/8" with scrap thermal layer to achieve consistent surface.
   d. Use tapered insulation panels in areas requiring slope to achieve a minimum slope of ¼ inch per foot, and where required to redirect drainage.
2. Keep insulation absolutely dry at all times. Discard insulation that contains moisture.
   a. Install only as much insulation as can be covered with roofing membrane the same day.
3. Repair any defects or installation errors prior to next phase of roof system installation.

B. Second Layer
1. Starting at the low edge of the roof, loose lay thermal layer board with a 6" offset from the previous layer.
   a. Install boards with long joints continuous.
      1) Install with long joints running parallel to the decking

b. Stagger short joints.
c. Butt joints tightly.
1) "Occasional" joint widths up to 1/8" will be allowed. Fill all any widths greater than 1/8" with scrap thermal layer to achieve consistent surface.
d. Use tapered insulation panels in areas requiring slope to achieve a minimum slope of ¼ inch per foot, and where required to redirect drainage.

2. Keep insulation absolutely dry at all times. Discard insulation that contains moisture.
a. Install only as much insulation as can be covered with roofing membrane the same day.

3. Repair any defects or installation errors prior to next phase of roof system installation.

3.04 INSTALLING THERMAL PROTECTIVE LAYER:

A. Starting at the low edge of the roof offset the thermal protective layer 6", mechanically attach using fasteners approved for the specific project.
1. Starting at the low edge of the roof, mechanical fasten (completely through the deck) thermal protective layer board.
a. Install boards with long joints continuous.
1) Install with long joints running parallel to the decking.
b. Stagger short joints.
c. Butt joints tightly.
1) "Occasional" joint widths up to 1/8" will be allowed. Fill all any widths greater than 1/8" with scrap thermal protective layer to achieve consistent surface.
2. Fasten at a rate of five (5) insulation fasteners per board for wood deck.
a. Install fasteners no closer than 6 inches to the board edge.
b. Size fasteners for adequate penetration.
3. Fasten at density required to resist expected uplift pressures for metal deck.
a. Increase fasteners density at perimeters and corners in accordance wit FM Global Property Loss Prevention Data Sheet 1-29.
b. Install fasteners no closer than 6 inches to the board edge.
c. Size fasteners for adequate penetration.
4. Keep insulation absolutely dry at all times. Discard insulation that contains moisture.
a. Install only as much insulation as can be covered with roofing membrane the same day.
5. Repair any defects or installation errors prior to next phase of roof system installation.

3.05 INSTALLING SINGLE PLY MEMBRANE:

A. At end of each day's work, protect installed roofing and insulation by closing off edge of system with water cut-off.
   1. Remove water cut-off sealants completely and clean prior to resuming roofing application.

B. Allow field sheets to relax for a minimum of 30 minutes before securing membrane.

C. Starting at low edge, install membrane to properly prepared substrate following manufacturer's instructions for complete installation of a mechanically fastened membrane and in accordance to ASTM D 5082.
   1. Begin by applying the sheets shingle fashion with all side laps perpendicular to the slope.
   2. Install membrane with the sidelap perpendicular to the direction of steel deck flutes.
      a. Install fasteners with a frequency and row spacing as determined available approvals meeting wind uplift resistance and code criteria.
         1) Install the special corner and perimeter securement zone in accordance with the FM Global 1-28 & 1-29 Property Loss Prevention Data Sheets.
      b. Use a fastener specifically designed for the purpose of performing to the higher loads expected from mechanically attached single ply (no less than No. 15) and corresponding higher performance 2 3/8-inch plates.
   3. Accurately align membrane and maintain uniform side and end laps of minimum dimensions required by manufacturer.
      a. Stagger end laps.
      b. Construct field laps such that a minimum 1.5 inch lap can be continuously heat-welded.
   4. At all intersections with vertical walls, curbs, etc., and at all penetrations (drains, pipes, etc.) secure the membrane using a fastener specifically designed for the purpose of performing to the higher loads expected from mechanically attached single ply (no less than No. 15) and corresponding higher performance 2 3/8-inch plates.
      a. Cover fasteners with a heat-welded membrane and minimum 1.5 inch heat welded laps.

D. Quality Control of Seams:
   1. Check all seams for integrity with a blunt-ended probe.
   2. Each day, pull apart several sections of seams welded that day to test the quality of welds.
      a. Should the welds be deficient (i.e., the weld pulls apart rather than de-lamination of the sheet), a more thorough examination of the work performed must be carried out and necessary repairs made.
   3. Repair any openings or "fishmouths" with a hand-held hot air tool fitted with a narrow nozzle tip and with a roller.

3.06 INSTALLING FLASHINGS

A. Preparation:
   1. Inspect walls, curb heights, counterflashings, etc., and check for conformance with minimum base flashing height of 8 inches.
      a. Correct non-conforming areas prior to installation of flashing.

B. Membrane Flashing:
   1. Prepare all substrates to accept the membrane in accordance with Manufacturer's specifications.
   2. Fully adhere flashings using Manufacturer's Solvent Adhesive.
      a. Secure all wall and curb flashings at their top edge in strict accordance with Manufacturer's Flashing Specifications.
   3. Use Manufacturer's pre-molded flashings.

C. Edge Metals:
   1. Construct all metal edging, scuppers and overflows with TPO-Coated Metal.
      a. Fabricate all TPO-Coated metal to form hemmed edges to prevent sharp metal edges from cutting the membrane, except when installed in conjunction with wood nailers.

D. Walkpads:
   1. Install Manufacturer's TPO Walkpad over clean, dry surfaces.
   2. Lay out areas where material is to be installed with most of the material oriented so that it is placed between field seams.
      a. Allow approximately 1" gaps between TPO Walkpad sections for drainage.
   3. Heat weld a 1.5-inch perimeter of the pad.
      a. Check seams for voids that might prevent water tightness.

E. Grease Exhaust Vents:
   1. Install a second thickness of field membrane, welded at the entire perimeter.
      a. Extend a minimum of two times the height of the exhaust fan, but not less than four feet out from the vent curb in all directions.

3.07 INSPECTION:

A. After all roofing system Work is completed, provide an inspection by the roofing system manufacturer's representative. Representative must be employed expressly as a technical employee and not concurrently function in a sales role. Provide, via the representative, documentation verifying that roofing system has been installed according to the Specifications.

3.08 CLEANING:

A. Keep newly installed roofing membrane clean and new in appearance under the assumption that all areas of roofing are aesthetically essential. Contractor may be directed to remedy – and if no remedy available – replace, newly roofed areas that are not maintained as such during the balance of installation.

B. Restore all other building surfaces and areas affected by roofing application to same condition of aforementioned on day of job start.

C. Remove all debris from roof and staging areas.

END OF SECTION

SECTION 07 60 00 – FLASHING AND SHEET METAL

PART 1 – GENERAL

1.01 Requirements of Division 00 and Division 01 apply to the Work of this Section.

1.02 DESCRIPTION OF WORK: Provide complete flashings, louvers, gutters, downspouts, scuppers, etc. as indicated on the drawings.

A. Related Documents: Built-up Asphalt Roofing System is specified in Section 07 51 00, Roof Accessories are specified in Section 07 72 00.

1.03 QUALITY ASSURANCE: Conform the Work to details shown, and to applicable fabrication requirements of "Architectural Sheet Metal Manual" by SMACNA. Comply with installation details of "Roofing and Waterproofing Manual" by NRCA.

1.04 PROJECT CONDITIONS: Coordinate the Work with interfacing and adjoining Work.

PART 2 – PRODUCTS

2.01 FLASHING AND SHEET METAL MATERIALS

A. Zinc-Coated Steel: Commercial quality with 0.20% copper, ASTM A 525 except ASTM A 527 for lock-forming, G90 hot-dip galvanized, mill phosphatized where indicated for painting; 26 gauge except as otherwise indicated.

B. Solder: For use with steel or copper, provide 50-50 tin/lead solder, ASTM B 32, with rosin flux.

C. Fasteners: Same metal as flashing/sheet metal or other non-corrosive metal. Match finish, type and size of exposed heads with material being fastened.
1. Sheetmetal to wood: Screws shall be No. 8 minimum and shall penetrate wood blocking minimum 1.5 inches and shall have watertight neoprene washers under head.
2. Sheetmetal to sheetmetal: Self-tapping sheet metal screws of ½" length and a minimum of No. 3 diameter. Screws shall have neoprene washers under head.
3. Sheetmetal to masonry: "Tapcon" threaded anchors, 3/16" minimum diameter, length to penetrate masonry a minimum of 1.5", manufactured by Buildex, a division of Illinois Tools Works, Inc., or approved equal.

D. Bituminous Coating: FS TT-C-494 or SSPC-Paint 12, solvent type bituminous mastic, nominally free of sulfur, compounded for 15-mil dry film thickness per coat.

E. Mastic Sealant: Polyisobutylene; non-hardening, non-skinning, non-drying, non-migrating sealant.

F. Elastomeric Sealant: Generic type recommended by manufacturer; comply with FS TT-S-0027, TT-S-00230, or TT-S-001543.

G. Reglets: Reglet above roof base flashing on masonry parapets shall be Fry Springlock Flashing System MA as manufactured by FRY Reglet Corp., Alhambra, CA.

H. Elastic Flashing Filler: Closed-cell polyethylene.

I. Plastic Roofing Cement: ASTM D 2822, asphaltic.

J. Peel and Stick Underlayment: Bituthene Waterproofing Membrane by Grace Construction Products, (866) 333-3726, or approved equal.

K. Back-of-Canopy Vents at Parapet Bracing: Round top louvers, 8" x 8" min. Galvanized steel, backed with 1/8" mesh galvanized hardware cloth as provided by Simpson Co. or approved equal.

L. Back-of-Canopy Vents: Galvanized steel rectangular louver vents, 16" x 8", backed with 1/8" mesh galvanized hardware cloth.

2.02 METAL FABRICATION: Shop-fabricate work to greatest extent possible. Comply with details shown, and with applicable requirements to SMACNA "Architectural Sheet Metal Manual".

A. Separations: Provide for separation of metal from non-compatible metal or corrosive substrates.

PART 3 – EXECUTION

3.01 INSTALLATION REQUIREMENTS: Except as otherwise indicated, comply with manufacturer's installation instructions and recommendations, and with SMACNA "Architectural Sheet Metal Manual". All coping joints shall be 1" deep interlocking "loose lock" seams or flat lock soldered joints where movement is not necessary (at contractor's option). Fasteners shall be installed through slotted holes. After fabrication, but prior to installation, backprime all coping and flashing.

3.02 LOUVERS: Install back of canopy louvers spaced at 10'-0" o.c. or as indicated on the drawings. Frame shall be with an approved fire rated assembly when required by code.

3.03 CLEANING AND PROTECTION: Clean exposed surfaces, removing substances which might cause corrosion of metal or deterioration of finishes.

END OF SECTION

SECTION 07 84 00 – FIRESTOPPING

PART 1 – GENERAL

1.01 Requirements for Division 00 and Division 01 apply to the Work of this Section.

1.02 DESCRIPTION OF WORK: Provide complete firestopping system for all penetrations of fire rated walls, floors and partitions by pipe, duct, cable, other electrical openings or in blank openings.

1.03 QUALITY ASSURANCE:

A. Firestopping work shall be performed by a single subcontractor to maintain consistency and accountability on the project.

B. Firestopping materials shall conform to ASTM E 814, UL 1479 and Factory Mutual Approval Guide.

1.04 PROJECT CONDITIONS:

A. Designs selected for installation shall provide a fire resistance rating at least equal to the hourly resistance rating of the floor, wall, or partition into which the firestop design will be installed.

B. When more than one firestop is applicable, individual product characteristics should be evaluated for secondary benefits in performance, e.g. environmental/water scaling, or ease of installation/modification.

C. Firestop systems shall be installed in all openings and around all penetrating elements or devices as required by these Contract Documents, and as required by applicable design, building and construction codes, subject to the interpretation of the authority having jurisdiction.

D. Firestop materials shall have the approval of the authority having jurisdiction.

1.05 PROJECT WARRANTY: Contractor shall certify compliance with the provisions of this section.

PART 2 – PRODUCTS

2.01 MANUFACTURERS: 3M Fire Barrier, Penetration Sealing System; Nelson Electric Firestop System; Dow Corning.

PART 3 – EXECUTION

3.01 PREPARATION: Verify that all penetrating elements and supporting devices have been installed and all temporary lines have been removed. Surfaces which will be in contact with penetration and seal materials shall be clean and free of dust, dirt, grease, oil, loose materials, rust or other substances.

3.02 APPLICATION: Install penetration seal materials in accordance with design requirements and manufacturer's instructions. Follow manufacturer's recommendations to obtain a smooth, professional finish.

3.03 CLEANING AND PROTECTION: Remove all loose or damaged materials. Remove equipment, materials, and debris, leaving area in a clean, undamaged condition.

END OF SECTION

SECTION 07 90 00 – JOINT SEALERS

PART 1 – GENERAL

1.01 Requirements of Division 00 and Division 01 apply to the Work of this Section.

1.02 DESCRIPTION OF WORK: Provide complete joint sealer systems in all required locations.

A. Related Documents: Flashing and Sheet Metal is specified in Section 07 60 00, Glass and Glazing is specified in Section 08 81 00, and Built-up Roofing System is specified in Section 07 51 00.

1.03 QUALITY ASSURANCE: Employ only firms engaged in caulking as a primary service.

1.04 PROJECT CONDITIONS: Do not proceed with installation of liquid sealants under unfavorable weather conditions.

1.05 SPECIAL PROJECT GUARANTEE, ELASTOMERIC SEALANTS: Repair sealant installation at leaks or, if leakage is excessive, replace sealant installation as directed.

A. Provide written guarantee, signed by the Contractor, guaranteeing all sealant work against defective material or workmanship for a period of five years.

PART 2 – PRODUCTS

2.01 MATERIALS: Provide colors indicated or, if not otherwise indicated, color shall match adjacent surfaces.

A. Elastomeric Sealants: Two-Component Polysulfide Sealant (for exterior and interior joints of tilt-up concrete panels and masonry or concrete joints): Polysulfide-based. Two-part elastomeric sealant, complying with FS TT-S-00227, Class A, Type 2 (non-sag).

B. Two-Component Polyurethane Sealant: Polyurethane-based, 2-part elastomeric sealant (for all areas, except aluminum storefront, asphalt joints, and exterior walks) complying with FS TT-S-00227, Class A, Type 1 (self-leveling).

C. Exterior Silicone Rubber Sealant: Silicone rubber-based, one-part elastomeric sealant (for exterior and interior joints of storefront glass and doors only) complying with FS TT-S-001543, Class A. Provide non-acid, porous-bond type silicone rubber sealant where one or both joint faces are masonry, stone, concrete or other porous materials. G.E. Silpruf Sealant, or Dow Corning 790 Sealant, or an approved equal. Provide acid, nonporous-bond type silicone rubber sealant where both joint faces are metal, glass, plastic, or other non-porous material. G.E. 1200 Sealant, Dow Corning 781 Sealant, or an approved equal.

D. Interior Mildew-Resistant Silicone Rubber Sealant (for interior joints): Silicone rubber-based, one-part elastomeric sealant, complying with FS TT-S-001543, Class A; compounded specifically for mildew resistance and recommended by manufacturer for interior joints in wet areas; passing ANSI A136.1 test for mold growth.

E. Synthetic Resin Caulking Compound: Oil-based caulking compound (for interior drywall) complying with FS TT-C-598, non-staining, non-bleeding, paintable.

F. Closed-Cell Synthetic Rubber Joint Filler: Provide expanded synthetic rubber complying with ASTM D 1056, Class SC-E.

G. Closed-Cell PVC Joint Filler: Provide flexible expanded polyvinyl chloride complying with ASTM D 1667, Grade VE 41 BL.

H. Closed-Cell Semi-Rigid Plastic Joint Filler: Provide semi-rigid, compressible, non-staining closed-cell plastic joint filler.

I. Expanded Polyethylene Joint Filler: Provide flexible, compressible, closed-cell, polyethylene.

J. Bond Breaker Tape: Polyethylene tape or other plastic tape as recommended by sealant manufacturer.

K. Sealant Backer Rod: Compressible rod stock of polyethylene foam, polyethylene jacketed polyurethane foam, butyl rubber foam, neoprene foam or other flexible, material as recommended by sealant manufacturer.

PART 3 – EXECUTION

3.01 MANUFACTURER'S INSTRUCTIONS: Comply with manufacturer's printed instructions except where more stringent requirements are shown or specified.

3.02 JOINT PREPARATION: Clean joint surfaces immediately before installation of sealant or caulking compound. Prime or seal joint surfaces where indicated, and where recommended by sealant manufacturer. Etch concrete and masonry joint surfaces to remove excess alkalinity.

3.03 INSTALLATION: Install sealants as recommended by manufacturer.

A. For sidewalks, pavements and similar joints sealed with elastomeric sealants and subject to traffic and other abrasion and indentation exposures, fill joints to a depth equal to 75% of joint width, but neither more than 5/8" deep nor less than 3/8" deep.

B. For normal moving joints sealed with elastomeric sealants but not subject to traffic, fill joints to a depth equal to 50% of joint width, but neither more than ½" deep nor less than ¼" deep.

C. For joints sealed with non-elastomeric sealants and caulking compounds, fill joints to a depth in range of 75% to 125% of joint width.

3.04 SPILLAGE: Clean adjoining surfaces to eliminate evidence of spillage or over-application.

3.05 CURE AND PROTECTION: Cure sealants and caulking compounds in compliance with manufacturer's instructions and recommendations.

END OF SECTION

(PAGE INTENTIONALLY LEFT BLANK)

SECTION 08 11 00 – STEEL DOORS AND FRAMES

PART 1 – GENERAL

1.01 Requirements of Division 00 and Division 01 apply to the Work of this Section.

1.02 DESCRIPTION OF WORK: Provide complete hollow steel doors and frames. Insulated door shall be provided for exterior door.

A. RELATED DOCUMENTS: hardware is specified in Section 08 71 00.

1.03 QUALITY ASSURANCE:

A. Provide doors and frames complying with Steel Door Institute "Recommended Specifications for Standard Steel Doors and Frames" (ANSI/SDI A250.8).

B. Manufacturers: Amweld Building Products, Ceco Door Products, Curries, Deansteel Manufacturing Co., HMF Express, Mesker Door, Pioneer Industries, Inc., Security Metal Products Corp., Steelcraft, Windsor Republic Doors.

C. Fire-Rated Assemblies: Construct and install assemblies to comply with NFPA Standard No. 80, applicable codes and regulations.

1.04 DELIVERY, STORAGE AND HANDLING: Deliver hollow metal work cartoned or crated to provide protection during transit and job storage.

PART 2 – PRODUCTS

2.01 MATERIALS:

A. Standard Steel Doors:
1. Provide metal doors of Level 1 and Model 1 for scheduled interior doors.
2. Provide insulated metal door of Level 2 and Model 1 for exterior doors serving conditioned/insulated area. The core material shall be polyurethane for non-rated door and polystyrene with self-extinguishing and non-toxic, in case of fire, for fire-rated door unless prohibited by the local codes and regulations.
3. Provide metal door of Level 2 and Model 1 for exterior doors serving non-conditioned/non-insulated area.
4. Provide 18-gauge minimum doors.

B. Standard Steel Frames: Fabricate frames with mitered corners, welded construction for exterior applications and knocked down for field assembly at interior applications. Interior and exterior frames to be 16-gauge.

C. Supports and Anchors: Fabricate of not less than 18-gauge galvanized sheet steel.

D. Door Silencers: Except on weatherstripped frames, drill stops to receive 3 silencers on strike jambs of single-swing frames and 2 silencers on heads of double-swing frames.

E. Door Louvers: Fabricate louvers and mount flush into doors without overlapping moldings on surface of door facing sheets. Louvers to be not less than 16-gauge galvanized steel sheet. Fabricate units with stationary, weatherproof Z-shaped blades and U-shaped frames, depth equal to door thickness. Provide removable insect screens on interior side of frame.

F. Restroom Door Frame: Timely pre-finished steel door frame, series “S” or “C” in sizes where “S” is not available, or approved equal. Frames shall be pre-finished in browntone color.

PART 3 – EXECUTION

3.01 INSTALLATION: Comply with provisions of SDI-100 and ANSI/SDI A 250.11 “Recommended Erection Instructions for Steel Frames and Doors”. Install fire-rated frames in accordance with NFPA Std. No. 80.

A. Electrical Room Door: Provide a standard louver approximately 24” x 16” in all exterior electrical room doors.

3.02 ADJUST AND CLEAN:

A. Prime Coat Touch-up: Immediately after erection, sand smooth any rusted or damaged areas of prime coat and apply touch-up of compatible air-drying primer on non-prefinished surfaces only.

B. Final Adjustments: Check and re-adjust operating finish hardware items, leaving steel doors and frames undamaged and in complete and proper operating condition. Remove and replace all defective work.

END OF SECTION

SECTION 08 14 00 – WOOD DOORS

PART 1 – GENERAL

1.01 Requirements of Division 00 and Division 01 apply to the Work of this Section.

1.02 DESCRIPTION OF WORK: Provide complete wood doors.

A. Related Documents: Steel frames are specified in Section 08 11 00 and Hardware is specified in Section 08 71 00.

1.03 SUBMITTALS:

A. Samples: Submit samples for wood veneer panel with transparent finish as indicated on the drawings.

1.04 QUALITY ASSURANCE: Comply with requirements of the NWMA Industry Standard 1.S.1 “Wood Flush Doors” of the National Woodwork Manufacturer’s Association.

A. Product Delivery, Storage and Handling: Protect wood doors during transit, storage and handling. Comply with the “On-Site Care” recommendations of NWMA pamphlet “Care and Finishing of Wood Doors” and with manufacturer’s instructions.

1.05 DELIVERY, STORAGE AND HANDLING: Deliver wood doors cartoned or crated to provide protection during transit and job storage.

1.06 SPECIAL PROJECT WARRANTY: Provide manufacturer’s warranty for two years for solid core wood doors.

PART 2 – PRODUCTS

2.01 MATERIALS AND COMPONENTS: Provide wood doors complying with applicable requirements of NWMA 1.S.1.

A. Face Panels: Manufacturer’s standard 2 or 3-ply face panels, unless otherwise indicated, with custom grade suitable for transparent finish.

B. Metal Louvers: 20-gauge, galvanized and factory primed for paint finish. Factory cut openings. When standard service of door manufacturer, factory install metal louvers in prepared openings; otherwise install only flush wood beads in prepared openings.

C. Restroom Doors: Honeycomb hollow core door “Legacy”, with light oak finish, by Haley (714/670-2112), AHC model, or approved equal. Undercut doors by 1”.

PART 3 – EXECUTION

3.01 INSPECTION: Examine door frames and verify that frames are correct type and have been installed for proper hanging of corresponding doors.

3.02 INSTALLATION:

A. Condition doors to average prevailing humidity in installation area prior to hanging.

B. Manufacturer's Instructions: Install wood doors in accordance with manufacturer's instructions and as shown.

C. Job Site Finished Doors: See Painting Sections for requirements for finishing wood doors.

D. Adjust and Cleaning Operations: Re-hang or replace doors which do not swing or operate freely.

E. Finished Doors: Refinish or replace doors damaged during installation.

F. Protection and Completed Work: Protect installed wood doors from damage or deterioration until acceptance of the Work.

END OF SECTION

SECTION 083600 - SECTIONAL OVERHEAD DOORS

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Glazed Aluminum Sectional Overhead Doors

B. Electric Operators and Controls.

C. Operating Hardware, tracks, and support.

1.2 RELATED SECTIONS

A. Section 03300 - Cast-In-Place Concrete: Prepared opening in concrete. Execution requirements for placement of anchors in concrete wall construction.

B. Section 04810 - Unit Masonry Assemblies: Prepared opening in masonry. Execution requirements for placement of anchors in masonry wall construction.

C. Section 05500 - Metal Fabrications: Steel frame and supports.

D. Section 07900 - Joint Sealers: Perimeter sealant and backup materials.

E. Section 08710 - Door Hardware: Cylinder locks.

F. Section 09910 - Paints and Coatings: Field painting.

1.3 REFERENCES

A. ANSI/DASMA 102 - American National Standard Specifications for Sectional Overhead Type Doors.

1.4 DESIGN / PERFORMANCE REQUIREMENTS

A. Wind Loads: Design and size components to withstand loads caused by pressure and suction of wind acting normal to plane of wall as calculated in accordance with applicable code.

B. Wiring Connections: Requirements for electrical characteristics.
   1. 115 volts, single phase, 60 Hz.
   2. 230 volts, single phase, 60 Hz.
   3. 230 volts, three phase, 60 Hz.

4. 460 volts, three phase, 60 Hz.

C. Single-Source Responsibility: Provide doors, tracks, motors, and accessories from one manufacturer for each type of door. Provide secondary components from source acceptable to manufacturer of primary components.

1.5 SUBMITTALS

A. Submit under provisions of Section 01300.

B. Product Data: Manufacturer's data sheets on each product to be used, including:
1. Preparation instructions and recommendations.
2. Storage and handling requirements and recommendations.
3. Installation methods.

C. Shop Drawings: Indicate plans and elevations including opening dimensions and required tolerances, connection details, anchorage spacing, hardware locations, and installation details.

D. Manufacturer's Certificates: Certify products meet or exceed specified requirements.

E. Operation and Maintenance Data.

1.6 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section with minimum five years documented experience.

B. Installer Qualifications: Authorized representative of the manufacturer with minimum five years documented experience.

C. Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories, Inc. acceptable to authority having jurisdiction as suitable for purpose specified.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Store products in manufacturer's unopened labeled packaging until ready for installation.

B. Protect materials from exposure to moisture until ready for installation.

C. Store materials in a dry, ventilated weathertight location.

1.8 PROJECT CONDITIONS

A. Pre-Installation Conference: Convene a pre-installation conference just prior to commencement of field operations, to establish procedures to maintain optimum working conditions and to coordinate this work with related and adjacent work.

1.9 WARRANTY

A. Warranty: Manufacturer's limited door and operators System warranty for 10 year against delamination of polyurethane foam from steel face and all other components for 3 years or 20,000 cycles, whichever comes first.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacturer: Overhead Door Corp., 2501 S. State Hwy. 121, Suite 200, Lewisville, TX 75067. ASD. Tel. Toll Free: (800) 275-3290. Phone: (469) 549-7100. Fax: (972) 906-1499. Web Site: www.overheaddoor.com. E-mail: sales@overheaddoor.com.

B. Substitutions: Equal Manufacturer, submit documentation to Architect for review.

C. Requests for substitutions will be considered in accordance with provisions of Section 01600.

2.2 INSULATED SECTIONAL OVERHEAD DOORS

A. Insulated Steel Sectional Overhead Doors: 596 Series Thermacore Insulated Steel Doors by Overhead Door Corporation. Units shall have the following characteristics:
   1. Door Assembly: Metal/foam/metal sandwich panel construction, with PVC thermal break and weather-tight ship-lap design meeting joints.
      a. Panel Thickness: 2 inches (51 mm).
      b. Exterior Surface: Flush..
      c. Exterior Steel: 20 gauge, galvanized.
      d. End Stiles: 16 gauge with thermal break.
      e. Spring Counterbalance: Sized to weight of the door, with a helically wound, oil tempered torsion spring mounted on a steel shaft; cable drum of diecast aluminum with high strength galvanized aircraft cable. Sized with a minimum 7 to 1 safety factor.
         1) High cycle spring: 100,000 cycles.
      f. Insulation: CFC-free and HCFC-free polyurethane, fully encapsulated.
      g. Thermal Values: R-value of 17.40; U-value of 0.057.
      h. Air Infiltration: 0.08 cfm at 15 mph; 0.08 cfm at 25 mph.
      i. Sound Transmission: Class 26.
      j. High-Usage Package: Provide with optional high-usage package.
         1) Full Glazed Aluminum Sash Panels:

(i) 1/2 inch (12.5 mm) Tempered Insulating Glass.
(ii) 1/2 inch (12.5 mm) Low E Insulated glazing.

2. Finish and Color:
   a. Two coat baked-on polyester:
      1) Interior color, white.
      2) Exterior color, RAL 7023.
3. Windload Design: Provide to meet the Design/Performance requirements specified.
4. Hardware: Galvanized steel hinges and fixtures. Ball bearing rollers with hardened steel races.
5. Lock:
   a. Locking mechanism designed to maintain security for exterior while permitting break out when impacted from the inside.
6. Weatherstripping:
   a. EPDM bulb-type strip at bottom section.
   b. Flexible Jamb seals.
   c. Flexible Header seal.
7. Track: Provide track as recommended by manufacturer to suit loading required and clearances available.
   a. Size:
      1) 2 inch (51 mm).
   b. Type:
      1) Vertical lift.
      2) Low headroom.
8. Manual Operation: Chain hoist.
9. Electric Motor Operation: Provide UL listed electric operator, size and type as recommended by manufacturer to move door in either direction at not less than 2/3 foot nor more than 1 foot per second. Operator shall meet UL325/2010 requirements for continuous monitoring of safety devices.
   a. Entrapment Protection: Required for momentary contact, includes radio control operation.
      1) Pneumatic sensing edge up to 18 feet (5.5 m) wide. Constant contact only complying with UL 325/2010.
      2) Electric sensing edge monitored to meet UL 325/2010.
      3) Photoelectric sensors monitored to meet UL 325/2010.
   b. Operator Controls:
      1) Push-button operated control stations with open, close, and stop buttons.
      2) Key operated control stations with open, close, and stop buttons.
      3) Push-button and key operated control stations with open, close, and stop buttons.
      4) Flush mounting (exterior installations)
      5) Surface mounting (interior installations)
      6) Both interior and exterior location.
   c. Special Operation:

1) Pull switch.
2) Vehicle detector operation.
3) Radio control operation.
4) Card reader control.
5) Photocell operation.
6) Door timer operation.
7) Commercial light package.
8) Explosion and dust ignition proof control wiring.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Do not begin installation until openings have been properly prepared.

B. Verify wall openings are ready to receive work and opening dimensions and tolerances are within specified limits.

C. Verify electric power is available and of correct characteristics.

D. If preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.2 PREPARATION

A. Clean surfaces thoroughly prior to installation.

B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

3.3 INSTALLATION

A. Install overhead doors and track in accordance with approved shop drawings and the manufacturer’s printed instructions.

B. Coordinate installation with adjacent work to ensure proper clearances and allow for maintenance.

C. Anchor assembly to wall construction and building framing without distortion or stress.

D. Securely brace door tracks suspended from structure. Secure tracks to structural members only.

E. Fit and align door assembly including hardware.

F. Coordinate installation of electrical service. Complete power and control wiring from disconnect to unit components.

3.4 CLEANING AND ADJUSTING

A. Adjust door assembly to smooth operation and in full contact with weatherstripping.

B. Clean doors, frames and glass.

C. Remove temporary labels and visible markings.

3.5 PROTECTION

A. Do not permit construction traffic through overhead door openings after adjustment and cleaning.

B. Protect installed products until completion of project.

C. Touch-up, damaged coatings and finishes and repair minor damage before Substantial Completion.

END OF SECTION

SECTION 08 41 00 – ALUMINUM ENTRANCES AND STOREFRONTS

PART 1 – GENERAL

1.01 Requirements of Division 00 and Division 01 apply to the Work of this Section.

1.02 DESCRIPTION OF WORK: Provide complete Aluminum Entrances, Storefront Systems, Column Cladding, and complete Aluminum Trim.

A. Related Documents: Joint Sealers is specified in Section 07 90 00, Glass and Glazing is specified in Section 08 81 00 and Hardware is specified in Section 08 71 00.

B. Types of aluminum entrances and storefronts include: Exterior entrance doors, frames for exterior entrances and storefront type framing system.

1.03 SUBMITTALS:

A. Product Data: Submit complete manufacturer's product data.

B. Samples: Submit samples of aluminum storefront members complete with final finish.

C. Shop Drawings: Submit shop drawings for fabrication and installation of aluminum entrances and storefronts, including elevations, sill flashing details, detail sections of typical composite members, anchorages, reinforcement, expansion provisions, and glazing with complete manufacturer's data.

1.04 QUALITY ASSURANCE: Comply with applicable provisions of "Metal Curtain Wall, Window, Storefront, and Entrance Guide Specifications manual" by AAMA. Provide aluminum entrances and aluminum storefront systems produced by a single manufacturer.

A. Provide aluminum entrances and storefront systems by: Kawneer Company, Inc., U.S. Aluminum Corp. or Vista Wall.

B. Manufacturer's stock systems shall have been tested in accordance with ASTM E 330 to withstand uniform pressures of 20 psf inward and outward, in accordance with ASTM E 283 for air filtration, and ASTM E 331 for water infiltration.

C. Field Measurement: Whenever possible, take field measurements prior to preparation of shop drawings and fabrication.

1.05 PROJECT CONDITIONS: Examine the substrates and conditions under which this Work is to be installed. Do not proceed with any installation work until all satisfactory conditions have been fully corrected.

PART 2 – PRODUCTS

2.01 MATERIALS AND ACCESSORIES:

A. Aluminum Members: Alloy and temper recommended by manufacturer for strength, corrosion resistance, and application of required finish; ASTM B221 for extrusions, ASTM B 209 for sheet/plate.

B. Fasteners: For brackets and reinforcements use manufacturer's high-strength aluminum units where feasible; otherwise, nonmagnetic stainless steel or hot-dip galvanized steel complying with ASTM A 386.

C. Concrete/Masonry Inserts: Cast iron malleable iron, or hot-dip galvanized steel complying with ASTM A 386.

D. Bituminous Coatings: Cold-applied asphalt mastic complying with SSPC-PS 12, compound for 30-mil thickness per coat.

E. Sliding Weather-Stripping: Manufacturer's standard replaceable stripping of wool, polypropylene, or nylon pile, with nylon fabric and aluminum strip backing, complying with AAMA 701.2.

F. Sealants and Gaskets: Provide sealants and gaskets in the fabrication, assembly, and installation of the Work, which are recommended and guaranteed by the manufacturer.

G. Aluminum Entrance Doors shall be equal to Kawneer Narrow Stile "190" doors with 10" bottom rail.

H. Storefront shall be equal to Kawneer "Trifab VG 450" center, for single glazing system and Kawneer "Trifab VG 451T" center, for double glazing system.

2.02 HARDWARE: Refer to Hardware section of Division 8 for requirements for hardware items other than those indicated herein to be provided by manufacturer of aluminum entrances. Provide door manufacturer's standard heavy-duty hardware units as shown, scheduled, or required for operation of each door, including the following items finished to match or unless otherwise indicated.

A. Offset pivot sets for single acting doors: Assemblies complying with ANSI A156.4, Grade I requirements, with exposed parts cast aluminum alloy.

B. Aluminum Front Entry Door:

1.	Pivot Set	Jackson JED J-34 x color to match storefront
2.	2 Cylinders	Yale 1152
3.	1 Deadbolt	Adams Rite MS1852S-050
4.	1 Trim Strike	Adams Rite 4000
5.	1 Cylinder Guard	Adams Rite MS 4043
6.	1 Indicator	Adams Rite 4089
7.	1 Concealed Closer	Jackson JED 21-201-628 with 105° hold open. Meet ADA and accessible code requirements.
8.	1 Threshold	Pemko 170 x door width.
9.	1 Sign	(Included with indicator) “THIS DOOR TO REMAIN UNLOCKED WHEN BUILDING IS OCCUPIED”
10.	1 Sign	Accessible sign per code requirements.

C. Aluminum Double Front Entry Doors:

1.	2 Pivot Sets	Jackson JED J-34 x color to match storefront
2.	2 Cylinders	Yale 1152 (Inside to have Thumbturn)
3.	1 Deadbolt	Adams Rite MS1852S-050
4.	1 Trim Strike	Adams Rite 4000
5.	1 Cylinder Guard	Adams Rite MS 4043
6.	1 Header Bolt	Adams Rite 4085
7.	1Threshold Bolt	Adams Rite 4015
8.	1Indicator	Adams Rite 4089
9.	2 Concealed Closers	Jackson JED 21-201-628 with 105° hold open. Meet ADA and accessible code requirements.
10.	1 Threshold	Pemko 170 x door width.
11.	1 Sign	(Included with indicator) “THIS DOOR TO REMAIN UNLOCKED WHEN BUILDING IS OCCUPIED”
12.	1 Sign	Accessible sign per code requirements.

D. Doors shall be provided with pull bar equal to Kawneer CO-9 at exterior side and push bar equal to Kawneer CP-II at interior side per door. Both pull bar and push bar shall be stainless steel finish.

E. Doors shall be provided with 1-3/4” x 11” mail slot with aluminum hinged cover by C.R. Laurence. Mail slot color to match storefront.

2.03 FABRICATION:

A. Prefabrication: To the greatest extent possible, complete fabrication before shipment to project site. Preglaze door and frame units to greatest extent possible. Do not drill and tap for surface-mounted hardware items until time of installation at project site.

B. Welding: Comply with AWS recommendations to avoid discoloration; grind exposed welds smooth and restore mechanical finish.

C. Fasteners: Conceal fasteners whenever possible.

D. Finger Guards: Provide finger guards of collapsible neoprene or PVC gasketing securely anchored into frame at hinge-jamb of pivoted doors.

E. Stile-and-Rail Type Aluminum Doors: Except as otherwise shown or scheduled, provide doors 1 ¾" thick and 3 ½" nominal width, as described in AAMA publications. Factory glaze door with ¼" tempered glass.

2.04 FINISHES:

A. Anodized Aluminum Finishes: Shall be Architectural Class I anodic coating with color conforming to Aluminum Association Standard AA-M12 C22 A41/44. Color shall be as indicated on the drawings.

B. Kynar Aluminum Finishes: Finish shall comply with AAMA specification 605.2-90, Color shall be as indicated on the drawings.

C. Silicone Polyster Aluminum Finishes: Finish shall comply with AAMA specification 605.2-90, Color shall be as indicated on the drawings.

D. (Specifier to include job specific information)

PART 3 – EXECUTION

3.01 INSTALLATION:

A. Comply with manufacturer's instructions and recommendations for installation of aluminum entrances and storefronts.

B. Set units plumb, level true to line, without warp or rack of framing members, doors, or panels. Anchor securely in place, separating aluminum and other corrodible metal surfaces from sources of corrosion or electrolytic action at points of contact with other materials.

C. Set sill members and other members in bed of compound or with joint fillers or gaskets to provide weather-tight construction. Comply with requirements of Division 7 for compounds, fillers, and gaskets.

3.02 ADJUST AND CLEAN:

A. Adjust operating hardware to function properly, without binding, and to provide tight fit at contact points and weather-stripping.

B. Clean completed system, inside and out, promptly after erection and installation of glass and sealants.

3.03 PROTECTION OF WORK: Protect aluminum entrances and storefront work from damage and deterioration during remainder of construction period.

END OF SECTION

(PAGE INTENTIONALLY LEFT BLANK)

SECTION 08 43 00 – ALUMINUM STOREFRONTS

PART 1 – GENERAL

1.01 Requirements of Division 00 and Division 01 apply to the Work of this Section.

1.02 DESCRIPTION OF WORK: Provide complete Aluminum Storefront Systems, Column Cladding and complete Aluminum Trim.

A. Related Documents: Joint Sealers is specified in Section 07 90 00, Automatic Entrance Systems are specified in Section 08 42 29, Glass and Glazing is specified in Section 08 81 00 and Hardware is specified in Section 08 71 00.

B. Types of aluminum storefronts include: Storefront type framing system.

1.03 SUBMITTALS:

A. Product Data: Submit complete manufacturer's product data.

B. Samples: Submit samples of aluminum storefront members complete with final finish.

C. Shop Drawings: Furnish shop drawings for fabrication and installation of aluminum storefronts, including elevations, sill flashing details, detail sections of typical composite members, anchorages, reinforcement, expansion provisions, and glazing.

1.04 QUALITY ASSURANCE: Comply with applicable provisions of "Metal Curtain Wall, Window, Storefront, and Entrance Guide Specifications Manual" by AAMA. Provide aluminum storefront systems produced by a single manufacturer.

A. Provide aluminum storefront systems by Kawneer Company, Inc., U.S. Aluminum Corp. or Vista Wall.

B. Manufacturer's stock systems shall have been tested in accordance with ASTM E 330 to withstand uniform pressures of 20 psf inward and outward, in accordance with ASTM E 283 for air filtration, and ASTM E 331 for water infiltration.

C. Field Measurements: Whenever possible, take field measurements prior to preparation of shop drawings and fabrication.

1.05 PROJECT CONDITION: Examine the substrates and conditions under which this Work is to be installed. Do not proceed with any installation work until all unsatisfactory conditions have been fully corrected.

PART 2 – PRODUCTS

2.01 MATERIAL AND ACCESSORIES:

A. Aluminum Members: Alloy and temper recommended by manufacturer for strength, corrosion resistance, and application of required finish; ASTM B 221 for extrusion, ATM B 209 for sheet/plate.

B. Fasteners: For brackets and reinforcements use manufacturer's high-strength aluminum units where feasible; otherwise, nonmagnetic stainless steel or hot-dip galvanized steel complying with ASTM A 386.

C. Concrete/Masonry Inserts: Cast iron malleable iron or hot-dip galvanized steel complying with ASTM A 386.

D. Bituminous Coatings: Cold-applied asphalt mastic complying with SSPC-PS 12, compound for 30-mil thickness per coat.

E. Sliding Weather-stripping: Manufacturer's standard replaceable stripping of wool, polypropylene, or nylon pile, with nylon fabric and aluminum strip backing, complying with AAMA 701.2.

F. Sealants and Gaskets: Provide sealants and gaskets in the fabrication, assembly, and installation of the Work, which are recommended and guaranteed by the manufacturer.

G. Storefront shall be equal to Kawneer "Trifab VG 450" center, for single glazing system and Kawneer "Trifab VG 451T" center, for double glazing system.

2.02 FABRICATION:

A. Prefabrication: To the greatest extent possible, complete fabrication before shipment to project site. Do not drill and tap for surface-mounted hardware items until time of installation at project site.

B. Welding: Comply with AWS recommendation to avoid discoloration; grind exposed welds smooth and restore mechanical finish.

C. Fasteners: Conceal fasteners whenever possible.

2.04 FINISHES:

A. Anodized Aluminum Finishes: Shall be Architectural Class I anodic coating with color conforming to Aluminum Association Standard AA-M12 C22 A42/44. Color shall be as indicated on drawings.

B. Kynar Aluminum Finishes: Finish shall comply with AAMA specification 605.2-90, Color shall be as indicated on drawings.

C. Silicone Polyster Aluminum Finishes: Finish shall comply with AAMA specification 605.2-90, Color shall be as indicated on drawings.

D. (Specifier to include job specific information.)

PART 3 – EXECUTION

3.01 INSTALLATION:

A. Comply with manufacturer's instructions and recommendations for installation of aluminum storefronts.

B. Set units plumb, level and true to line, without warp or rack of framing members, doors, or panels. Anchor securely in place, separating aluminum and other corrodible metal surfaces from sources of corrosion of electrolytic action at point of contact with other materials.

C. Set sill members and other members in bed of compound or with joint fillers or gaskets to provide weather-tight construction. Comply with requirements of Division 07 for compounds, fillers, and gaskets.

3.02 ADJUST AND CLEAN: Clean completed system, inside and out, promptly after erection and installation of glass and sealants.

3.03 PROTECTION OF WORK: Protect aluminum storefront work from damage and deterioration during remainder of construction period.

END OF SECTION

(PAGE INTENTIONALLY LEFT BLANK)

SECTION 08 53 13 - VINYL WINDOWS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes fixed and operable vinyl framed windows.

1.2 PERFORMANCE REQUIREMENTS

A. General: Provide vinyl windows capable of complying with performance requirements indicated, based on testing manufacturer's windows that are representative of those specified, and that are of test size required by AAMA/WDMA 101/I.S.2/NAFS.

B. Structural Performance: Provide vinyl windows capable of withstanding the effects of the following loads, based on testing units representative of those indicated for Project that pass AAMA/WDMA 101/I.S.2/NAFS, Uniform Load Structural Test:

1. Design Wind Loads: Determine design wind loads applicable to Project from basic wind speed indicated in miles per hour at 33 feet above grade, according to ASCE 7, Section 6.5, "Method 2-Analytical Procedure," based on mean roof heights above grade indicated on Drawings.

    a. Basic Wind Speed: 110 mph ultimate wind speed design, ASCE 7-10
    b. Importance Factor: 1
    c. Exposure Category: B.

C. Windborne-Debris Resistance: Provide glazed windows capable of resisting impact from windborne debris, based on the pass/fail criteria as determined from testing glazed windows identical to those specified, according to ASTM E 1886 and testing information in ASTM E 1996 or AAMA 506 and requirements of authorities having jurisdiction.

1.3 SUBMITTALS

A. Product Data: For each type of vinyl window indicated.

B. Shop Drawings: Include plans, elevations, sections, details, hardware, attachments to other work, operational clearances, and installation details.

C. Samples: For each exposed finish.

D. Product Schedule: Use same designations indicated on Drawings.

E. Product test reports.

F. Maintenance data.

1.4 QUALITY ASSURANCE

A. Installer: A qualified installer, approved by manufacturer to install manufacturer's products.

B. Glazing Publications: Comply with published recommendations of glass manufacturers and with GANA's "Glazing Manual" unless more stringent requirements are indicated.

C. Mockups: Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.

1.5 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace vinyl windows that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Failure to meet performance requirements.
b. Structural failures including excessive deflection, water leakage, air infiltration, or condensation.
c. Faulty operation of movable sash and hardware.
d. Deterioration of vinyl, other materials, and finishes beyond normal weathering.
e. Failure of insulating glass.

2. Warranty Period:

a. Window: Five years from date of Substantial Completion.
b. Glazing: Five years from date of Substantial Completion.
c. Vinyl Finish: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products from reputable manufacturers.

2.2 WINDOW

A. Window Type: As indicated on a schedule, located on sheet A8.0.

B. Comply with AAMA/WDMA 101/I.S.2/NAFS.
1. Performance Class and Grade: AW45.

C. Condensation-Resistance Factor (CRF): Provide vinyl windows tested for thermal performance according to AAMA 1503, showing a CRF of 52.

D. Thermal Transmittance: Provide vinyl windows with a whole-window, U-factor maximum indicated at 15-mph exterior wind velocity and winter condition temperatures when tested according to AAMA 1503.

1. U-Factor: 0.29 Btu/sq. ft. x h x deg F or less.

E. Solar Heat-Gain Coefficient (SHGC): Provide vinyl windows with a whole-window SHGC maximum of 0.38, determined according to NFRC 200 procedures.

2.3 GLAZING

A. Glass and Glazing Materials: Refer to Division 08 Section "Glazing" for glass units and glazing requirements applicable to glazed vinyl window units.

B. Glass: Refer fenestration assembly schedule located on sheet M1.1 (building efficiency standards) at a minimum provide Insulating-glass units, with low-E coating pyrolytic on second surface or sputtered on second or third surface complying with Division 08 Section "Glazing."

C. Glazing System: Manufacturer's standard factory-glazing system that produces weathertight seal and complies with requirements for windborne-debris resistance.

2.4 INSECT SCREENS

A. General: Design windows and hardware to accommodate screens in a tight-fitting, removable arrangement, with a minimum of exposed fasteners and latches. Fabricate insect screens to fully integrate with window frame. Locate screens on outside of window and provide for each operable exterior sash or ventilator.

1. Aluminum Tubular Frame Screens: Comply with SMA 1004, "Specifications for Aluminum Tubular Frame Screens for Windows"

B. Aluminum Insect Screen Frames: Manufacturer's standard aluminum alloy complying with SMA 1004. Fabricate frames with mitered or coped joints or corner extrusions, concealed fasteners, adjustable rollers, and removable PVC spline/anchor concealing edge of frame.

1. Aluminum Tubular Framing Sections and Cross Braces: Roll formed from aluminum sheet with minimum wall thickness as required for class indicated.
2. Finish: Baked-on organic coating in manufacturer's standard color.

C. Aluminum Wire Fabric: 18-by-16 mesh of 0.011-inch- diameter, coated aluminum wire.

1. Wire-Fabric Finish: Charcoal gray.

2.5 FABRICATION

A. Fabricate vinyl windows that are reglazable without dismantling sash or ventilator framing.

B. Weather Stripping: Provide full-perimeter weather stripping for each operable sash and ventilator.

C. Mullions: Provide mullions and cover plates as shown, compatible with window units, complete with anchors for support to structure and installation of window units. Allow for erection tolerances and provide for movement of window units due to thermal expansion and building deflections, as indicated. Provide mullions and cover plates capable of withstanding design loads of window units. Provide manufacturer's standard finish to match window units.

D. Subframes: Provide subframes with anchors for window units as shown, of profile and dimensions indicated but not less than 0.062-inch- thick extruded aluminum. Miter or cope corners, and weld and dress smooth with concealed mechanical joint fasteners. Provide manufacturer's standard finish to match window units. Provide subframes capable of withstanding design loads of window units.

E. Glazing Stops: Provide nailed or snap-on glazing stops coordinated with Division 08 Section "Glazing" and glazing system indicated. Provide glazing stops to match sash and ventilator frames.

2.6 VINYL FINISHES

A. Integral Finish and Color: Uniform, solid, homogeneous interior and exterior as selected by the Architect from Manufacturer’s full range of available colors.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Comply with Drawings, Shop Drawings, and manufacturer's written instructions for installing windows, hardware, accessories, and other components.

B. Install windows level, plumb, square, true to line, without distortion or impeding thermal movement, anchored securely in place to structural support, and in proper relation to wall flashing and other adjacent construction.

C. Set sill members in bed of sealant or with gaskets, as indicated, for weathertight construction.

D. Separate aluminum and other corrodible surfaces from sources of corrosion or electrolytic action at points of contact with other materials.

E. Adjust operating sashes and ventilators, screens, hardware, and accessories for a tight fit at contact points and weather stripping for smooth operation and weathertight closure. Lubricate hardware and moving parts.

F. Clean exposed surfaces immediately after installing windows. Avoid damaging protective coatings and finishes. Remove excess sealants, glazing materials, dirt, and other substances.

G. Clean factory-glazed glass immediately after installing windows. Comply with manufacturer's written recommendations for final cleaning and maintenance. Remove nonpermanent labels, and clean surfaces.

H. Remove and replace glass that has been broken, chipped, cracked, abraded, or damaged during construction period.

END OF SECTION 08 53 13

(PAGE INTENTIONALLY LEFT BLANK)

SECTION 087100 - DOOR HARDWARE

PART 1 - GENERAL

1.1 DESCRIPTION OF WORK: Provide complete “Builders Hardware” as shown and specified.

A. Related Documents: Steel Doors and Frames are specified in Section 08 11 00 and Wood Doors are specified in Section 08 14 00.

1.2 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: Details of electrified door hardware.

C. Samples: For each exposed product and for each color and texture specified.

D. Other Action Submittals:

1. Door Hardware Schedule: Prepared by or under the supervision of Installer, detailing fabrication and assembly of door hardware, as well as installation procedures and diagrams. Coordinate final door hardware schedule with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish of door hardware.

    a. Format: Use same scheduling sequence, format and use same door numbers as in the Contract Documents.
    b. Content: Include the following information:

        1) Identification number, location, hand, fire rating, size, and material of each door and frame.
        2) Locations of each door hardware set, cross-referenced to Drawings on floor plans and to door and frame schedule.
        3) Complete designations, including name and manufacturer, type, style, function, size, quantity, function, and finish of each door hardware product.
        4) Description of electrified door hardware sequences of operation and interfaces with other building control systems.

2. Keying Schedule: Prepared by or under the supervision of Installer, detailing Owner's final keying instructions for locks.

1.3 QUALITY ASSURANCE

A. Installer Qualifications: Supplier of products and an employer of workers trained and approved by product manufacturers and an Architectural Hardware Consultant who is available during the course of the Work to consult with Contractor, Architect, and Owner about door hardware and keying.

B. Architectural Hardware Consultant Qualifications: A person who is experienced in providing consulting services for door hardware installations that are comparable in material, design, and extent to that indicated for this Project and who is currently certified by DHI as follows:

1. For door hardware, an Architectural Hardware Consultant (AHC) who is also an Electrified Hardware Consultant (EHC).

C. Source Limitations: Provide electrified door hardware from same manufacturer as mechanical door hardware, unless otherwise indicated. Manufacturers that perform electrical modifications and that are listed by a testing and inspecting agency acceptable to authorities having jurisdiction are acceptable.

D. Fire-Rated Door Assemblies: Where fire-rated door assemblies are indicated, provide door hardware rated for use in assemblies complying with NFPA 80 that are listed and labeled by a qualified testing agency, for fire-protection ratings indicated, based on testing at positive pressure according to NFPA 252 or UL 10C, unless otherwise indicated.

E. Smoke- and Draft-Control Door Assemblies: Where smoke- and draft-control door assemblies are required, provide door hardware that meet requirements of assemblies tested according to UL 1784 and installed in compliance with NFPA 105.

1. Air Leakage Rate: Maximum air leakage of 0.3 cfm/sq. ft. at the tested pressure differential of 0.3-inch wg of water.

F. Electrified Door Hardware: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction.

G. Means of Egress Doors: Latches do not require more than 5 lbf to release the latch. Locks do not require use of a key, tool, or special knowledge for operation.

H. Accessibility Requirements: For door hardware on doors in an accessible route, comply with the Current version of the California Accessibility Standards in Chapter 11B of the California Building Code and the current version of the Federal ADA Standards for Accessible Design.

1. Provide operating devices that do not require tight grasping, pinching, or twisting of the wrist and that operate with a force of not more than 5 lbf.
2. Comply with the following maximum opening-force requirements:

a. Interior, Non-Fire-Rated Hinged Doors: 5 lbf applied perpendicular to door.
b. Sliding or Folding Doors: 5 lbf applied parallel to door at latch.
c. Fire Doors: Minimum opening force allowable by authorities having jurisdiction.

3. Bevel raised thresholds with a slope of not more than 1:2. Provide thresholds not more than 1/2 inch high.
4. Adjust door closer sweep periods so that, from an open position of 70 degrees, the door will take at least 3 seconds to move to a point 3 inches from the latch, measured to the leading edge of the door.

I. Keying Conference: Conduct conference at Project site to comply with requirements in Division 01 Section "Project Management and Coordination."

1.4 DELIVERY, STORAGE, AND HANDLING

A. Deliver keys to manufacturer of key control system for subsequent delivery to Owner.

B. Deliver keys and permanent cores to Owner by registered mail or overnight package service.

1.5 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of door hardware that fail in materials or workmanship within specified warranty period.

1. Warranty Period: Five (5) years from date of Substantial Completion, unless otherwise indicated.

PART 2 - PRODUCTS

2.1 SCHEDULED DOOR HARDWARE

A. Provide door hardware for each door as scheduled on Drawings to comply with requirements in this Section.

1. Door Hardware Sets: Provide quantity, item, size, finish or color indicated, and products equivalent in function and comparable in quality to named products. Substitutions of products listed in door hardware sets on drawings shall be submitted to the architect for approval.

2. Sequence of Operation: Provide electrified door hardware function, sequence of operation, and interface with other building control systems indicated.

2.2 KEYING

A. Keying System: Factory registered, complying with guidelines in BHMA A156.28, Appendix A. Incorporate decisions made in keying conference.
   1. No Master Key System: Only change keys operate cylinder.
   2. Master Key System: Change keys and a master key operate cylinders.
   3. Keyed Alike: Key all cylinders to same change key.

B. Keys: Nickel silver or Brass.

   1. Stamping: Permanently inscribe each key with a visual key control number and include the following notation:

      a. Notation: "DO NOT DUPLICATE”

   2. Quantity: In addition to one extra key blank for each lock, provide the following:

      a. Cylinder Change Keys: Three.
      b. Master Keys: Five.

2.3 KEY CONTROL SYSTEM

A. Key Control Cabinet: BHMA A156.5; metal cabinet with baked-enamel finish; containing key-holding hooks, labels, 2 sets of key tags with self-locking key holders, key-gathering envelopes, and temporary and permanent markers; with key capacity of 150 percent of the number of locks.

   1. Wall-Mounted Cabinet: Cabinet with hinged-panel door equipped with key-holding panels and pin-tumbler cylinder door lock.

2.4 FABRICATION

A. Fasteners: Provide door hardware manufactured to comply with published templates prepared for machine, wood, and sheet metal screws. Provide screws that comply with commercially recognized industry standards for application intended, except aluminum fasteners are not permitted. Provide Phillips flat-head screws with finished heads to match surface of door hardware, unless otherwise indicated.

   1. Concealed Fasteners: For door hardware units that are exposed when door is closed, except for units already specified with concealed fasteners. Do not use through bolts for installation where bolt head or nut on opposite face is exposed

unless it is the only means of securely attaching the door hardware. Where through bolts are used on hollow door and frame construction, provide sleeves for each through bolt.

2. Fire-Rated Applications:

   a. Wood or Machine Screws: For the following:

      1) Hinges mortised to doors or frames.
      2) Strike plates to frames.
      3) Closers to doors and frames.

   b. Steel Through Bolts: For the following unless door blocking is provided:

      1) Surface hinges to doors.
      2) Closers to doors and frames.
      3) Surface-mounted exit devices.

3. Spacers or Sex Bolts: For through bolting of hollow-metal doors.
4. Gasketing Fasteners: Provide noncorrosive fasteners for exterior applications and elsewhere as indicated.

2.5 FINISHES

A. Provide finishes as indicated in door hardware schedule.

B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Steel Doors and Frames: For surface applied door hardware, drill and tap doors and frames according to ANSI/SDI A250.6.

B. Set units level, plumb and true to line and location. Adjust and reinforce the attachment substrate as necessary for proper installation and operation.

C. Mounting Heights: Mount door hardware units at heights indicated in “Recommended Locations for Builders Hardware for Standard Steel Doors and Frames” by the Door and Hardware Institute and as required by all accessible codes and regulations.

D. Install each door hardware item to comply with manufacturer's written instructions. Where cutting and fitting are required to install door hardware onto or into surfaces that are later to be painted or finished in another way, coordinate removal, storage, and

reinstallation of surface protective trim units with finishing work specified in Division 09 Sections. Do not install surface-mounted items until finishes have been completed on substrates involved.

1. Set units level, plumb, and true to line and location. Adjust and reinforce attachment substrates as necessary for proper installation and operation.
2. Drill and countersink units that are not factory prepared for anchorage fasteners. Space fasteners and anchors according to industry standards.

E. Hinges: Install types and in quantities indicated in door hardware schedule but not fewer than the number recommended by manufacturer for application indicated or whichever is more stringent.

F. Lock Cylinders: Install construction cores to secure building and areas during construction period.

1. Replace construction cores with permanent cores as directed by Owner.
2. Furnish permanent cores to Owner for installation.
3. Final keys shall not be issued to anyone except the Owner or his representative.

G. Key Control System: Tag keys and place them on markers and hooks in key control system cabinet, as determined by final keying schedule.

H. Boxed Power Supplies: Locate power supplies above accessible ceilings. Verify location with Architect.

1. Configuration: Provide least number of power supplies required to adequately serve doors with electrified door hardware.

I. Thresholds: Set thresholds for exterior doors and other doors indicated in full bed of sealant complying with requirements specified in Division 07 Section "Joint Sealants."

J. Stops: Provide floor stops for doors unless wall or other type stops are indicated in door hardware schedule. Do not mount floor stops where they will impede traffic.

K. Perimeter Gasketing: Apply to head and jamb, forming seal between door and frame.

L. Meeting Stile Gasketing: Fasten to meeting stiles, forming seal when doors are closed.

M. Door Bottoms: Apply to bottom of door, forming seal with threshold when door is closed.

N. Adjustment: Adjust and check each operating item of door hardware and each door to ensure proper operation or function of every unit. Replace units that cannot be adjusted to operate as intended. Adjust door control devices to compensate for final operation of heating and ventilating equipment and to comply with referenced accessibility requirements.

O. Verify hardware requirements with electrical utility company prior to installation.

3.2 FIELD QUALITY CONTROL

A. Independent Architectural Hardware Consultant: Contractor will engage a qualified independent Architectural Hardware Consultant to perform inspections and to prepare inspection reports.

3.3 ADJUST AND CLEAN: Adjust and clean each operating item of hardware and each door, to ensure proper operation or function of every unit. Replace units which cannot be adjusted to operate freely and smoothly as intended for the application made.

END OF SECTION 087100

(This sheet intentionally left blank)

SECTION 08 81 00 – GLASS AND GLAZING

PART 1 – GENERAL

1.01 Requirements of Division 00 and Division 01 apply to the Work of this Section.

1.02 DESCRIPTION OF WORK: Provide complete Glass and Glazing systems.

A. Related Documents: Aluminum Entrances and Storefronts are specified in Section 08 41 00, Aluminum Storefronts are specified in Section 08 43 00 and Automatic Entrance Systems are specified in Section 08 42 29.

1.03 QUALITY ASSURANCE:

A. Prime Glass Standard: FS DD-G-1403.

B. Heat-Treated Glass Standard: FS DD-G-1403.

C. Safety Glass Standard: CPSC 16 CFR 1201.

PART 2 – PRODUCTS

2.01 GLASS PRODUCTS:

A. Float Glass: Type 1, Quality q3, clear unless otherwise indicated. Thickness shall be 1/4” minimum unless otherwise noted.

B. Tempered Glass: Provide prime glass which has been heat treated to strengthen glass in bending to not less than 4.5 times annealed strength, clear unless otherwise indicated. Thickness shall be 1/4” minimum unless otherwise noted.

C. Insulating Glass: Conform to ASTM E774, Class CBA when tested in accordance with ASTM E773.

2.02 GLAZING SEALANTS AND COMPONENTS: Comply with manufacturer’s recommendations for selection of hardness. Select materials, and variations or modifications, carefully for compatibility with surfaces contacted in the installation.

A. Two-Component Polysulfide Glazing Sealant: Elastomeric polysulfide sealant complying with FS TT-S-227, Class A, Type 2.

2.03 GLAZING GASKETS:

A. Structural Rubber Glazing Gaskets: Neoprene extrusions fabricated into frames with molded corner units and zipper lock strips; comply with ASTM C 542.

B. Molded Neoprene Glazing Gaskets: Molded or extruded neoprene gaskets of the profile and hardness required for water-tight construction; comply with ASTM D 2000 designation 2BC 415 to 3BC 620, black.

2.04 MISCELLANEOUS GLAZING MATERIALS:

A. Cleaners, Primers and Sealers: Type recommended by sealant or gasket manufacturer.

B. Setting Blocks: Neoprene or EPDM, 70-90 durometer hardness with proven compatibility with sealants used.

C. Spacers: Neoprene or EPDM, 40-50 durometer hardness with proven compatibility with sealants used.

D. Compressible Filler (Rod): Closed-cell or waterproof-jacketed rod stock of synthetic rubber or plastic foam, proven to be compatible with sealants used, flexible and resilient, with 5-10 psi compression strength for 25% deflection.

PART 3 – EXECUTION

3.01 INSTALLATION STANDARDS AND PERFORMANCE: Watertight and airtight installation of each glass product is required, except as otherwise shown. Each installation must withstand normal temperature changes, wind loading and impact loading.

A. Comply with combined recommendations and technical reports by manufacturers of glass and glazing products as used in each glazing channel, and with recommendations of the Flat Glass Marketing Association “Glazing Manual”, except where more stringent requirements are indicated.

B. Cut entry door glass to accommodate aluminum mail slot.

3.02 PROTECTION AND CLEANING: Protect glass from breakage. All cracked or broken glass which cannot be properly clean, shall be replaced.

END OF SECTION

SECTION 09 21 00 – ARCHITECTURAL PRE-COATED EPS FOAM SHAPES

PART 1 – GENERAL

1.01 Requirements of Division 00 and Division 01 apply to the Work of this Section.

1.02 Description:

A. The Work included, but not limited to:
1. Pre-coated EPS (Expanded Polystryrene) Foam Shapes.
2. Plastering.
3. Coating and Painting.

1.03 SUBMITTALS:

A. Product Data: Submit manufacturer's and supplier's literature, specifically identifying materials to be incorporated into the fabrication process, and identifying the manufacturer's and supplier's recommend method of handling and installation. Provide pre-coat EPS foam shape manufacturer's letter that materials meet or exceed specified requirements.

B. Samples: Submit two (2) 12-inch long samples. One sample will have just the pre-coat base with reinforcing mesh showing the 1 ½" overlap extension. The second sample will show the complete pre-coated EPS foam shape with specified finish coat and texture. These will be held as quality samples for the Work performed.

C. Job Site Mock-up Samples: Upon review and acceptance of samples by the Architects, the Contractor shall prepare job site mock-up as specified in 1.04 Quality Assurance.

1.04 QUALITY ASSURANCE:

A. ICBO Report #3414.

B. UL 723 and ASTM E-84.

C. ASTM C109 Comprehensive,
ASTM C150 Portland Cement,
ASTM C190 Tensile,
ASTM C348 Flexural,
ASTM C666 Freeze/Thaw.

D. Job Site Mock-up: The Contractor shall prepare 4' wide sample mock-up using actual materials and finishes required for final work for Owner's review and

approval. The mock-ups shall be prepared concurrently with all other mock-ups required by the other sections of the specifications. The Contractor shall prepare all mock-ups and obtain the approval from the Owner prior to ordering any material for the project. Retain mock-up during construction as a standard for judging completed Pre-Coated EPS Foam Shapes work. Do not alter, move or destroy mock-up until the Work is completed and approved.

1.05 DELIVERY, HANDLING AND STORAGE

A. All materials shall be kept clean and dry. Where materials are to be stored in an exterior location, they should be stacked above ground, properly supported on level platforms, and fully protected from weather and direct sunlight exposure, as well as from damage due to impact.

B. Store Alpha Base Adhesive in a cool dry place protected from freezing. Store at no less than 40 degrees F and below 80 degrees F.

C. Store reinforcing mesh in dry place protected from exposure to moisture.

1.06 PROJECT/SITE CONDITIONS

A. Do not apply Pre-Coated EPS Foam Shapes in ambient temperatures below 40 degrees F. Provide supplementary heat during installation and drying period when temperatures less than 40 degree F prevail.

B. Do not apply Pre-Coated EPS Foam Shapes on frozen surfaces.

C. Maintain ambient temperature at or above 40 degrees F during and at least 48 hours after installation of Pre-Coated EPS Foam Shapes and until dry.

1.07 SEQUENCE AND SCHEDULING:

A. Coordinate and schedule installation of Pre-Coated EPS Foam Shapes with related Work of other sections.

B. Coordinate and schedule installation of trim, flashing, and joint sealers to prevent water infiltration behind system.

PART 2 – PRODUCTS

2.01 MANUFACTURERS AND SUPPLIERS

A. Pre-Coated EPS Foam Products shall be as manufactured and supplied by Bay Foam, Inc., Hayward, CA, phone number (800) 743-Foam (3626) or (510) 786-9663 or approved equal.

2.02 MATERIALS

A. Pre-Coated EPS Foam Material
   1. Material used for Pre-Coated EPS Foam Shapes shall have a density range of between .09 lb. and 1.25 lbs. per cubic foot. However, under certain conditions higher densities may be desirable, i.e. high impact areas. Physical properties of the EPS characteristics:
      a. Density .09 – 1.25 lbs. per cubic foot.
      b. Flexural Strength 25-30, 32-36, respectively.
      c. Tensile Strength 18-22, 23-25, respectively.
      d. Fire Hazard Characteristics
         (per UL723, ASTM E-84)
         1. Flame Spread 10-15
         2. Smoke Developed 40-125
         3. Fuel Contributed ND

B. Adhesives and Reinforcing Mesh: Provide all required adhesives and reinforcing mesh as required by supplier of Pre-Coated EPS Foam Shapes for proper installation.
   1. Pre-Coat Base Coat: As supplied by Bay Foam, Inc. Pre-Coat base consists of a liquid acrylic additive which is thoroughly mixed with a pre-sacked materials of sand and cement per manufacturer's written instructions. NOTE: Dry acrylic mixes are not allowed.
   2. Bonding Adhesive: Alpha Base, 100% acrylic adhesive recommended for attachment of pre-coated EPS Foam Shapes to masonry, stucco, poured-in-place concrete and exterior gyp sheathing.
      a. Alpha Base is to be mixed with Portland Cement conforming to ASTM C150, Type I, II, I/II, Grey of White; fresh and free of lumps.
   3. Bonding Adhesive (Plywood Substrates):
      Senerquick premixed adhesive is to be used when adhering Pre-Coated EPS Foam Shapes to plywood substrates. Use only the locations indicated on the drawings.
   4. Stucco Finish Coat: Standard blend of sand and cement with liquid acrylic polymers added per manufacturer's recommendations.
   5. Reinforcing Mesh: Pre-Coated shapes are to have a minimum 4 oz. alkaline resistant glass fiber mesh imbedded into Acrylic Pre-Coat base per manufacturer's recommendations.

C. Water: Clean fresh, portable and free of organic matter which can affect bonding or coating formulations.

PART 3 – EXECUTION

3.01 EXAMINATION:

A. Verify surfaces that are to receive the Work under this section and notify the Contractor in writing, with copy to the Architect, of all conditions detrimental to the timely completion of the Work. Do not proceed with the Work of this section until all unsatisfactory conditions have been corrected in a manner acceptable to the manufacturer and/or supplier of the materials.

3.02 PREPARATION:

A. General.
   1. Protect all surrounding areas and surfaces from damage and staining during application of Pre-Coated EPS Foam Shapes.

B. Masonry, Stucco or Concrete.
   1. Clean surfaces of foreign matter by brushing and use of clean water.
   2. Dampen surfaces to reduce excessive suction.

C. Exterior Grade Gyp-Sheathing or Woodframe Substrate.
   1. Examine surface to ensure a clean, dry surface for attachment Pre-Coated EPS Foam Shapes. Use a broom to remove any residue on surface. Do not wash with water or any detergents.

D. Pre-Coated EPS Foam Shapes.
   1. Clean EPS Foam Shapes of dust on bonding surfaces.

3.03 MIXING:

A. Alpha Base Adhesive:
   1. Mix and prepare material in clean container, free of foreign substances. Do not use container which has contained or been cleaned with a petroleum based product.
   2. Mix with Golblatt Jiffler Mixer No. 15311 H7 powered by ½ inch drill 400-500 RPM.
   3. Stir Alpha Base coat to homogeneous consistency before adding Portland Cement.
   4. Mix one part (by weight) Portland Cement with own part Alpha Base. Add Portland Cement in small increments, thoroughly mixing each increment to a homogenous consistency.
   5. Clean portable water may be added to adjust workability.
   6. Close container when not in use; pot life is same as ordinary mortar of plaster materials.
   7. Additives are not permitted.

B. Senerquick Adhesive:

1. Material is ready to use right from the pail.

C. Pre-Coat Acrylic Base Coat:
1. Mix and prepare materials in clean container, free of foreign substances. Do not use container which has contained or been cleaned with a petroleum based product.
2. Mix with Golblatt Jiffler Mixer No. 15311 H7 powered by ½ inch drill 400-500 RPM.
3. Thoroughly mix the pre-sacked cement and sand adding water as needed. Stir the liquid acrylic additive first then slowly add into mixer. Mix for a very short time (1-2 minutes). Over-mixing entrains excessive air. Let materials set for about 4-5 minutes (normal temperatures) so that material can take its initial set then re-temper before applying. NOTE: Dry premixes with acrylic additives are not allowed.

3.04 INSTALLATION:

A. Use a chalk line or laser to ensure a consistent straight line.

B. Ribbon and Dab Method: Apply a ribbon of mixed Alpha Base adhesive approximately 2 inches wide by 3/8 inch thick to entire perimeter of each board. Apply dabs or ribbons of 3/8 inch thickness of 4 inches in diameter, approximately 8 inches on center to interior of shape.

C. Notched Trowel Method: Apply adhesive to entire inside surface of Pre-Coated EPS Foam Shape using trowel with ½ x ½ inch notches spaced 1/2 inch apart, or 3/8 x 3/8 inch notches spaced 3/8 inch apart.

D. Apply shape starting at bottom along the chalk line. Apply pressure over entire surface of shape to ensure uniform contact and high initial grab. Do not allow Alpha Base adhesive to dry prior to installing. NOTE: Nails driven through Foam Shapes are not to penetrate protective paper behind the plaster.

E. Abut all joints tightly to ensure overall flush level surface. Cut slivers of insulation boards and fit into gaps between EPS Foam Shapes. Do not apply adhesive to ends of shapes.

F. Apply a minimum 3 inch wide reinforcing mesh 4 oz. glass fiber over abutting joints of EPS Foam Shapes. Apply the pre-coat base acrylic cement over mesh 1/16 inch thick and trowel into base coat leaving the same 1 ½ inch minimum of over lapping mesh.

G. Allow acrylic base coat to cure for 25 hours before applying finish coat.

3.05 FINISH COAT:

A. After curing, dampen base coat according to manufacturer's specifications and provide desired finish. Note that the same acrylic additive used in the base coat must be used in the plaster finish coat to ensure proper adhesion. NOTE: Dry acrylic polymers are not allowed.

END OF SECTION

SECTION 09 24 00 – LATH AND PLASTER

PART 1 – GENERAL

1.01 Requirements of Division 00 and Division 01 apply to the Work of this Section.

1.02 DESCRIPTION OF WORK: Provide complete stud partition and furring systems, metal lathing and three coat Portland cement plastering system.

A. Related Documents: Rough Carpentry is specified in Section 06 10 00.

B. Contractor's Option: The General Contractor has an option to use wood stud or metal stud system for non-bearing partitions except where wood framing is used structurally.

1.03 SUBMITTALS:

A. Samples: Submit samples of plaster showing finish colors and textures specified.

B. Job Site Mock-up Samples: Upon review and acceptance of samples by the Architects, the Contractor shall prepare job site mock-up as specified in 1.04 Quality Assurance.

1.04 QUALITY ASSURANCE:

A. In addition to compliance with applicable legal requirements, comply with the following standards.
1. Metal Lath/Steel Framing Association Division of the National Association of Architectural Metal Manufacturer (NAAMM), ML/SFA920, 4th Edition Guide Specifications for Metal Lathing and Furring.
2. Portland Cement Association's Portland Cement Plaster (Stucco) Manual.
3. ASTM C841 Standard Specification for Installation of Interior Lathing and Furring.
4. ASTM C1063 Installation of Lathing and Furring for Portland Cement Based Plaster. NOTE: ASTM C1063 has replaced ANSI 42.3.
5. ASTM C926 Application of Portland Cement Based Plaster.

B. Job Site Mock-up: The Contractor shall prepare a 8'x 8' sample wall panel mock-up using actual materials and finishes required for final work for the Owner's review and approval. The mock-ups shall be prepared concurrently with all other mock-ups required by the other sections of the specifications. The Contractor shall prepare all mock-ups and obtain the approval from the Owner prior to ordering any material for the project. Retain the mock-up during construction as a standard for judging completed plaster work. Do not alter, move or destroy mock-up until the Work is completed and approved.

C. Fire-Resistance Rating: Where plaster systems with fire-resistance ratings are indicated or are required, provide materials and installations which are identical with those of applicable assemblies tested per ASTM E119.

D. Allowable Tolerances: For flat surfaces, do not exceed 1/8" in 10'-0" for bow or warp of surface, and for plumb or level.

E. Reference Standard: Plaster and Drywall Systems Manual, Third Edition.

1.05 PROJECT CONDITIONS: Protect contiguous Work from soiling, spattering, moisture deterioration and other harmful effects which might result from plastering. For environmental conditions comply with the referenced standard.

PART 2 – PRODUCTS

2.01 METAL LATHING AND FURRING MATERIALS: Provide the type, weight, grade and finish of materials, and include for each system the accessories and trim as recommended by the manufacturer for the application indicated.

2.02 MATERIALS: All materials shall conform to the reference standards.

A. Portland Cement Plaster Materials:
1. Portland Cement: ASTM C150.
2. Plastic Cement: ASTM C1328.
3. Masonry Cement: ASTM C91.
4. Lime: ASTM C206 Type S.
5. Sand: ASTM C897 or C144.
6. Fibers: ASTM C1116.
7. Finish Plaster: Integrally colored, factory blended mineral-based stucco for pastel colors. All acrylic finish for deep tones and custom colors. Texture and color shall be noted on the drawings.
8. Water: Clean, fresh and potable.

B. Lath: Galvanized expanded metal lath, weighing not less than 3.4 lbs. per sq. yard and complying with ASTM C847. Self-furred type over sheathing and other rigid backing.

C. Paper: All building paper shall be Kraft paper, Fed. Spec UU-B-790, Grade B, or D as application dictates according to referenced standards and codes.

D. Exterior Exposed Plastering Accessories: Provide zinc alloy accessories for exterior work and the Work in "High Humidity" areas, except where fully concealed in plaster.

E. Wire Ties: Galvanized soft steel wire, not less than 16 gauge for tying furring channels to runner channels, and not less than 18 gauge for other ties.

F. Small Nosed Corner Reinforcement: Expanded type with 2-7/8" wide flanges, 24 gauge.

G. G-Channel Furring:
1. 1-1/2" cold rolled steel channels 475 lbs. per 1,000 lf.
2. 3/4" cold rolled steel channels 300 lbs. per 1,000 lf.

H. Furring Brackets: 20 gauge galvanized steel serrated-arm type, adjustable from ¼" to 2¼" wall clearance for channel furring.

I. Vented Drip Screed: 3" wide, No. SDE, as manufactured by Superior Metal Trim. Install in all canopy soffits at the locations shown on the drawings.

J. Lath Accessories: All lath accessories shall comply with ASTM C1047.

K. Stress Relief Joints:
1. Expansion Joints: Two piece No. 40 made of galvanized steel or zinc alloy.
2. Control Joints: One-piece XJ15-3 galvanized steel with expanded flanges.

L. Casing Beads: Galvanized steel with square edge and expanded flanges.

PART 3 – EXECUTION

3.01 PREPARATION: Coordinate the Work with structural ceiling work to ensure that inserts and other structural anchorage provisions have been installed to receive ceiling hangers.

3.02 INSTALLATION OF METAL SUPPORT SYSTEMS:

A. Isolation: Where lathing and metal support system abuts building structure horizontally, isolate the Work from structural movement sufficiently to prevent transfer of loading into the Work from the building structure.

B. Fixture Support Framing: Install supplementary framing, blocking and bracing where the Work is indicated to support fixtures, equipment, and similar Work requiring attachment and support.

C. Installation: Install all plastering system components according to ASTM C841, ASTM C1063 and C926, and to the referenced standards. Coordinate depth of accessories with thickness of and number of coats of plaster to be applied.

D. Install metal corner guards at external corners and corners reinforcement at all interior corners. Install casing beads at terminations of plaster work. Where plaster abuts concrete or masonry, set casing bead ¼" from concrete.

E. Provide metal expansion joints as shown on the drawings. If not shown, divide plaster with joints at a maximum of 10' on center with a maximum panel area of 100 s.f.

3.03 INSTALLATION OF PLASTER

A. Sequence plaster installation with the installation and protection of other Work, so that neither will be damaged by the installation of the others.

B. Apply plaster according to the methods outlined in the referenced standards.

C. For exterior plaster, do not apply when prevailing temperatures are below 40 degrees F. If freezing is expected only apply the amount of plaster that can hydrate prior to the freezing period, unless auxiliary heat and enclosures are provided to maintain temperature above 40 degrees F. In hot, dry and windy weather, protect fresh plaster from too rapid evaporation by misting, covering with plastic or canvass or both. Moist curing of portland cement plaster shall be done whenever the relative humidity is less than 70 percent. Curing shall be done regularly, including weekends and holidays.

3.04 CUTTING AND PATCHING: Cut, patch, and repair plaster as necessary to restore cracks, dents and imperfections. Repair or replace the Work to eliminate defects, including areas of the Work which do not comply with specified tolerances.

3.05 CLEANING AND PROTECTION: Remove temporary protection and remove plaster from surfaces which are not to be plastered.

END OF SECTION

SECTION 09 29 00 – GYPSUM DRYWALL

PART 1 – GENERAL

1.01 Requirements of Division 00 and Division 01 apply to the Work of this Section.

1.02 DESCRIPTION OF WORK: Provide complete Gypsum Drywall, Support System, and Drywall Finishing.

A. Related Documents: Rough Carpentry is specified in Section 06 10 00, Lath and Plaster is specified in Section 09 24 00 and Drywall Penetration Barrier in Section 09 29 01.

B. Contractor's Option: The General Contractor has option to use wood stud or metal stud system for non-bearing partitions except where wood framing is used structurally.

1.03 SUBMITTALS: Submittals are required only for suspended system when indicated on the drawings.

A. Product Data: Submit complete manufacturer's product data.

B. Shop Drawings: Furnish shop drawings indicating complete suspension system including connections, anchorage and trim features whenever deviations from the architectural drawings are proposed.

1.04 QUALITY ASSURANCE:

A. Fire-Resistance Rating: Where gypsum drywall systems with fire resistance ratings are indicated or are required, provide materials and installations identical with applicable assemblies which have been tested and listed by recognized authorities, including UL and ICC.

B. Tolerances for Drywall Work: Do not exceed a variations of 1/8" in 8'-0" from plumb, level and flat (all directions); and do not exceed 1/16" offset of planes at joints between panels.

C. The Work will conform to the following references:
1. ASTM C840: Standard Specification for Application and Finishing of Gypsum Board.
2. Gypsum Association GA 216: Application and Finishing of Gypsum Panel Products.

1.05 PROJECT CONDITIONS:

A. For environmental conditions, comply with referenced standards.

B. Gypsum wallboard shall not be installed until weather protection for the installation is provided.

PART 2 – PRODUCTS

2.01 METAL SUPPORT MATERIALS:

A. Ceiling Support Materials and Systems: Size ceiling support components to comply with ASTM C754.

B. Direct Suspension Systems Manufacturers: Chicago Metallic Corp., Donn Corp., National Rolling Mills Co., Roblin Building Products, Inc. and United States Gypsum Co.

C. Wall/Partition Support Materials: ASTM C645; 25 gage unless otherwise indicated. Provide heavier gage if required. Provide 20 gauge studs at walls to receive cement backer board.

D. Metal Furring Channels:
1. Hat-shaped: ASTM C645, 7/8 inch high, 25 gauge, with G40 hot-dipped galvanized coating per ASTM A525. Provide 20 gauge at furring to receive tile backer board.
2. Z-shaped: ASTM C645, depths as indicated, 24 gauge minimum, with G40 hot-dipped galvanized coating per ASTM A525.
3. Resilient: Manufacturer's standard type designed to reduce sound transmission; ½ inch deep, 25 gauge steel with G40 hot-dipped galvanized coating per ASTM A525.

E. Drywall Penetration Barrier Mesh: Supply and install Barrier Mesh steel expanded metal panels as a penetration barrier behind gypsum wallboard walls and/or ceilings, where noted on the drawings.
1. Barrier Mesh
   a. .75-9F Maximum Security (overall thickness .120”).

2. Barrier Mesh Clips: Barrier Mesh shall be attached to framing members using Barrier Mesh Clips and the appropriate threaded fasteners.

2.02 GYPSUM PANELS:

A. Manufacturers: United States Gypsum Co., National Gypsum Co., Georgia-Pacific Corp., Domtar and Hardie Gypsum.

B. Regular, ½” thick, 48” wide, up to 16’ long conforming to ASTM C1396.

C. Type X (fire resistant), 5/8” thick, 48” wide, up to 16’ long conforming to ASTM C1396.

D. Water-resistant type WR at plumbing fixture walls and areas. 1/2" thick, 48" wide with tapered edges conforming to ASTM C1396.

E. Cement Backer Board, ½" thick, Aggregated Portland cement board with woven glass fiber mesh facing; complying with ANSI A118.9.

F. Materials shall be kept dry. Gypsum panels shall be neatly stacked flat; avoid sagging and damage to edges, ends and surfaces.

2.03 TRIM ACCESSORIES:

A. Provide manufacturer's standard ASTM C1047 paper faced galvanized metal trim of types indicated for drywall work by USG, Trim-Tex or Phillips.

B. Control Joints: ¼" wide center channel, roll-formed zinc with perforated flanges as recommended by wallboard manufacturer. Provide removable tape strip over channel.

2.04 JOINT TREATMENT MATERIALS: ASTM C475; Type of tape and joint compound as manufactured or recommended by the wallboard manufacturer for the application indicated.

2.05 MISCELLANEOUS MATERIALS:

A. Screws: ASTM C1002 self-drilling, self-tapping bugle head drywall screws; No. 6 Type S. Self-drilling, self-tapping screws; steel, complying with ASTM C 1513; galvanized coating, plated or oil-phosphate coated complying with ASTM B 633 as needed for required corrosion resistance.

B. Nails: 5d, 1 5/8" long, flat headed, cement coated and conforming to ASTM C514.

C. Adhesive for Wood Attachment: ASTM C557.

D. Wire: Galvanized and annealed steel wire.
1. Hangar Wire: No. 8 SWG.
2. Tie Wire: No. 16 SWG

PART 3 – EXECUTION

3.01 PREPARATION FOR METAL SUPPORT SYSTEMS: Coordinate the Work with structural ceiling work to ensure that inserts and other structural anchorage provisions have been installed to receive ceiling hangers.

3.02 INSTALLATION OF METAL SUPPORT SYSTEMS:

A. Ceiling Support Suspension Systems: Secure hangers to structural support by connecting directly to structure where possible. Level main runners to a tolerance of ¼" in 12'-0". Install auxiliary framing at termination of drywall work, and at openings for light fixtures and similar work, as required. Main runners shall be kept clear of perimeter walls by not less than 1 inch. Install hat shaped furring channels at right angles of runner channels, spaced 24" o.c. and wire tied at each intersection with double strand of specified tie wire.

B. Wall/Partition Support Systems: Install framing according to reference standard. Install supplementary framing, blocking and bracing to support fixtures, equipment, and similar work which cannot be adequately supported on gypsum board alone. Refer to Lath and Plaster, Section 09100, for additional information on non-load bearing steel stud framing systems. Provide top runner track designed to accommodate anticipated deflection from overhead structure.

C. Metal Trim:
1. Provide corner bead at all outside corners and angles, metal casing where gypsum board terminates at uncased openings, metal edge trim where board edges abut horizontal and vertical surfaces of other construction.
2. Install trim in accordance with manufacturer's directions and secure to framing with proper fasteners through flange perforations. Apply trim in longest practical pieces.

D. Control Joints:
1. Install control joints at junction of gypsum board partitions with walls or partitions of other finish material.
2. Install control joints within long runs of partitions, ceilings or soffits at approximately 30'-0" on center or as indicated.
3. Where gypsum board is vertically continuous, as at stairwells, provide horizontal control joints at each floor level.

3.03 GYPSUM BOARD INSTALLATION:

A. Install wall/partition boards vertically to avoid end-butt joints wherever possible. Attach gypsum board to framing and blocking as required for additional support at openings and cutouts. Conform to ASTM C840 and GA 216.

B. Install gypsum board in accordance with referenced standards and manufacturer's recommendations.

C. Install gypsum board in temperatures above 55 degrees F. In cold weather provide auxiliary heat, if required, to keep temperature in the range of 55 degrees F to 70 degrees F.

3.04 FINISHING OF DRYWALL:

A. Apply treatment at gypsum board joints, flanges of trim accessories, and elsewhere as required to prepare the Work for decoration. Apply joint reinforcement tape at all joints where gypsum board is abutting. Finish shall be smooth and sanded. Textured finish is not acceptable.

B. All gypsum wallboard surfaces exposed to severe lighting conditions (natural or artificial) or where glossy paints are to be applied shall be Level 5 finished. Other areas not subject to severe lighting and decorated with wall covering or flat paints shall receive a Level 4 finish.

3.05 PROTECTION OF WORK: Protect gypsum drywall work from damage and deterioration during remainder of construction period.

3.06 CLEAN-UP: Upon completion, repair damage caused by the Work and remove debris, surplus materials and tools from site. Leave installation clean and ready for finishing.

END OF SECTION

(PAGE INTENTIONALLY LEFT BLANK)

SECTION 09 29 01 – DRYWALL PENETRATION BARRIER

PART 1 – GENERAL

1.01 Requirements of Division 00 and Division 01 apply to the Work of this Section.

1.02 DESCRIPTION OF WORK: Supply and install steel expanded metal panels as a penetration barrier behind gypsum using the manufacturers' recommended method of installation.

A. Related Documents: Light Metal Framing is specified in Section 05400 Rough Carpentry is specified in Section 06100, Gypsum Drywall is specified in Section 09290.
B. As manufactured by Alabama Metal Industries Corporation, (AMICO), Security Mesh shall be made from a sheet of steel that is simultaneously slit and stretched into a rigid, open mesh diamond making one continuous sheet that cannot unravel. The finished shape of the mesh openings shall be a flattened diamond. Conventional expanded metal not manufactured specifically for security purposes is NOT acceptable for this use.
C. Security Mesh shall be attached to framing members by using AMICO Secura Clips following the manufacturers recommended spacing. The supply of mesh fabric, and clips to attach mesh to framing members shall be supplied by one source to ensure the quality and level of security required.

1.03 SUBMITTALS: Submittals are required only for suspended system when indicated on the drawings.

A. Product Data: Submit complete manufacturer's product data and installation details for each product.
B. Samples of Security Mesh and Secura Clips shall be submitted for approval if required.

1.04 QUALITY ASSURANCE:

A. See Section 014000 – Quality Requirements, for quality assurance
B. Manufacturer of materials shall meet the requirements of "Buy American" domestic requirements.
C. Mesh and attachment clips shall be produced by the same manufacturer to ensure the level of security.

1.05 PROJECT CONDITIONS:

A. For environmental conditions, comply with referenced standards.

PART 2 – PRODUCTS

2.01 MANUFACTURER

A. The behind the drywall penetration barrier system shall conform to Security Mesh™ and installed in [walls] [and] [ceilings] using Secura Clips as manufactured by ALABAMA METAL INDUSTRIES CORPORATION, (AMICO), 3245 Fayette Avenue; Birmingham, AL 35208; Telephone 800/366-2642; Facsimile 205/786-6527; email securitymesh@gibraltar1.com.

2.02 PANELS

A. ASM.75–9F HEAVY – SUPER MAXIMUM SECURITY

1. Mesh size opening – width 0.563" inch x 1.688" inch long allowing 63 percent open area
2. Mesh strand thickness– 0.140 inch
3. Weight– 2.38 lbs. per square foot mill finish
4. Security Mesh is produced in a standard 4 foot x 8 foot panel.

B. ASM.75–9F MAXIMUM SECURITY

1. Mesh size opening – width 0.563 inch x 1.688 inch long allowing 63 percent open area
2. Mesh strand thickness– 0.120 inch
3. Weight– 1.71 lbs. per square foot mill finish
4. Security Mesh is produced in a standard 4 foot x 8 foot panel.

2.03 AMICO SECURA CLIPS

A. Security Mesh shall be attached to framing members using AMICO Secura Clips and the appropriate threaded fasteners.

1. For steel framing install a flat head bugle type self-tapping fine thread screw long enough to penetrate the framing member a minimum of 3/8 inch.
2. For wood framing applications install a 1-5/8 inch fine thread drywall screw allowing the fastener to penetrate the framing member at least 1½ inches.
3. Secura Clip spacing shall be a minimum of [12] [6] inches vertically per framing member.
4. In ceiling applications Secura Clips shall be spaced a minimum of [12] [6] inches along ceiling joists.

2.04 FINISH

A. Security Mesh is supplied "mill finish" HR P&O.

PART 3 – EXECUTION

3.01 PREPARATION Edit the following to suit project requirements.

A. Installation and lay-out of the job shall be approved by the owner or general contractor prior to installation.

B. It is recommended framing members be no less than 20GA.

3.2 INSTALLATION Edit the following to suit project requirements

A. Installation and lay-out of the job shall be approved by the owner or general contractor prior to installation.
B. Security Mesh panels may be installed with diamond running in either direction.
C. AMICO Secura Clips shall be installed to secure the mesh to the framing members.
D. Mesh joints occurring on framing members may either join staggered or butt together. It is also acceptable to overlap mesh joints with owner's approval.
E. Panels shall join, begin and terminate on a framing member.
F. Panels not joining on framing member shall be wire tied with 18GA steel tie wire. Wire tying shall be no less frequent than the installation of Secura Clips.

3.03 PROTECTION OF WORK: Protect work from damage and deterioration during remainder of construction period.

3.04 CLEAN-UP: Upon completion, repair damage caused by the Work and remove debris, surplus materials and tools from site. Leave installation clean and ready for finishing.

END OF SECTION

(PAGE INTENTIONALLY LEFT BLANK)

SECTION 09 30 00 – TILE

PART 1 – GENERAL

1.01 Requirements of Division 00 and Division 01 apply to the Work of this Section.

1.02 DESCRIPTION OF WORK: Provide complete tile system including grout and all accessories.

A. Related Documents: Concrete is specified in section 03 30 00 and Gypsum Board is specified in Section 09 29 00.

1.03 SUBMITTALS:

A. Samples: Submit samples for each type of tile and grout required.

B. Job Site Mock-up Samples: Upon review and acceptance of samples by the Architects, the Contractor shall prepare job site mock-up as specified in 1.04 Quality Assurance.

1.04 QUALITY ASSURANCE: Except as otherwise indicated, comply with TCA “Handbook for Ceramic Tile Installation”.

A. Job Site Mock-up: The Contractor shall prepare 4’ x 4’ sample wall panel mock-up using actual materials, finishes and grout joint required for final work for the Owner’s review and approval. The mock-ups shall be prepared concurrently with all other mock-ups required by the other sections of the specifications. The Contractor shall prepare all mock-ups and obtain the approval from the Owner prior to ordering any material for the project.

1.05 PROJECT CONDITIONS: Deliver packaged materials and store in original containers with seals unbroken and labels intact.

PART 2 – PRODUCTS

2.01 TILE PRODUCTS: As shown on the drawings.

A. Trim and Special Shapes: Rounded external corners, and trim shapes of the same material and finish as field tile.

2.02 SETTING MATERIALS:

A. Commercial Cement Grout: Proprietary compound, factory-blended to decrease shrinkage and increase moisture resistance.

PART 3 – EXECUTION

3.01 EXAMINATION: Examine surfaces to receive tile work and conditions under which tile will be installed. Do not proceed with tile work until surfaces and conditions comply with requirements indicated in referenced tile installation standard.

3.02 INSTALLATION:

A. ANSI Tile Installation Standard: Comply with applicable parts of ANSI 108 series of tile installation standards included under "American National Standard Specifications for the Installation of Ceramic Tile".

B. TCA Installation Guidelines: TCA "Handbook for Ceramic Tile Installation"; comply with TCA installation methods.

3.03 CLEANING AND PROTECTION: Upon completion of placement and grouting, clean all ceramic tile surfaces so they are free of foreign matter. Leave finished installation clean and free of cracked, chipped, broken, unbonded, or otherwise defective tile work. Prohibit foot and wheel traffic from using tiled floors for at least 7 days after grouting is completed.

END OF SECTION

SECTION 09 30 00 – TILE SETTING MATERIALS AND ACCESSORIES

PART 1 – GENERAL

1.1 SECTION INCLUDES

A. Edge-protection and transition profiles for floors.

1.2 RELATED SECTIONS

A. Section 03 30 00 – Concrete Work.

B. Section 06 10 00 - Rough Carpentry.

C. Section 07 90 00 - Joint Sealers.

D. Section 09 29 00 - Gypsum Drywall.

E. Section 09 30 00 - Tile.

1.3 REFERENCES

A. CSA B79-08: Floor, Area, and Shower Drains, and Cleanouts for Residential Construction.

B. IAPMO IGC 195: Interim Guide Criteria for Floor Drain with Integrated Bonding Flange.

C. Tile Council of North America (TCNA) Handbook for Ceramic Tile Installation.

D. American National Standard Specifications for the installation of ceramic tile A108 / A118 / A136.1.

1.4 SUBMITTALS

A. Submit under provisions of Volume 1 of the Project Specifications Manual.

B. Product Data: Manufacturer's data sheets on each product to be used, including:
1. Preparation instructions and recommendations.
2. Storage and handling requirements and recommendations.
3. Installation methods.

C. Verification Samples: For each finish product specified, two samples, minimum size 6 inches long, representing actual product, color, and finish.

D. Manufacturer's Certificates: Certify products meet or exceed specified requirements.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: Company specializing in performing the work of this section with minimum five years experience.

B. Source Limitations for Setting Materials and Accessories: Obtain product of a uniform quality for each application condition from a single manufacturer.

C. Mock-Up: Provide a mock-up for evaluation of surface preparation techniques and application workmanship.
1. Finish areas designated by Architect.
2. Do not proceed with remaining work until workmanship, color, and sheen are approved by Architect.
3. Refinish mock-up area as required to produce acceptable work.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Store products in manufacturer's unopened packaging until ready for installation.

B. Protect materials from exposure to moisture. Do not deliver until after wet work is complete and dry.

C. Store materials in a dry, warm, ventilated weathertight location.

1.7 PROJECT CONDITIONS

A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits.

1.8 COORDINATION

A. Coordinate Work with other operations and installation of floor finish materials to avoid damage to installed materials.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacturer: Schluter Systems, L.P., 194 Pleasant Ridge Road, Plattsburgh, NY 12901-5841. ASD. Tel: (800) 472-4588. Fax (800) 477-9783. E-mail:specassist@schluter.com. Web:www.schluter.com.

B. Requests for substitutions will be considered in accordance with provisions of Volume 2, section 12 of the project specifications manual.

2.2 EDGE-PROTECTION AND TRANSITION PROFILES FOR FLOORS

A. Schluter-SCHIENE
1. Description: L-shaped profile with 1/8 inch (3.2 mm) wide visible surface integrated trapezoid-perforated anchoring leg, and integrated grout joint spacer.
2. Material and Finish:
a. AE - Satin Anodized Aluminum.
1) Height as required to coordinate with tile selection and setting

system selected.

B. Schluter-RENO-TK
1. Description: profile with sloped exposed surface, 1/4 inch (6 mm) deep channel below exposed surface, integrated trapezoid-perforated anchoring leg, and integrated grout joint spacer.
2. Material and Finish:
a. AE - Satin Anodized Aluminum.
1) Height as required to coordinate with tile selection and setting system selected.

C. Schluter-RENO-U
1. Description: profile with sloped exposed surface, 5/32 inch (4 mm) tall leading edge, integrated trapezoid-perforated anchoring leg, and integrated grout joint spacer.
2. Material and Finish:
a. AE - Satin Anodized Aluminum.
1) Height as required to coordinate with tile selection and setting system selected.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Do not begin installation until substrates have been properly prepared.

B. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

3.2 PREPARATION

A. Clean surfaces thoroughly prior to installation.

B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

3.3 INSTALLATION

A. Install in accordance with manufacturer's instructions.

3.4 PROTECTION

A. Protect installed products until completion of project.

B. Touch-up, repair or replace damaged products before Substantial Completion.

END OF SECTION

(PAGE INTENTIONALLY LEFT BLANK)

SECTION 09 51 00 – ACOUSTICAL CEILINGS

PART 1 – GENERAL

1.01 Requirements of Division 00 and Division 01 apply to the Work of this Section.

1.02 DESCRIPTION OF WORK: Provide complete Acoustical Ceiling and Suspension system.

A. Related Documents: Gypsum Drywall is specified in Section 09 29 00.

1.03 QUALITY ASSURANCE:

A. ICC Approval: Only those products of the named manufacturer's having ICC approval are acceptable.

B. UL Rated Assemblies: Where acoustical ceilings are components of floor, roof or beam assemblies indicated for fire resistance rating, provide materials bearing UL Classification Marking for applicable UL design number listed in UL "Fire Resistance Index".

C. In addition to compliance with applicable legal requirements, comply with the following standards.
1. ASTM C635, Metal Suspension System for Acoustical Tile and Lay-in Panel Ceiling.
2. ASTM C636, Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-in Panels.
3. ASCE 7 Standard, American Society of Civil Engineers, Minimum Design Loads for Buildings and Other Structures, if applicable.
4. CISCA Seismic Zones 3 & 4 (IBC Seismic Design Categories D, E and F), Ceilings and Interior Systems Construction Association Guidelines for Seismic Restraint for Direct Hung Suspended Ceiling Assemblies, if applicable.

1.04 PROJECT CONDITIONS: Do not install interior acoustical ceilings until the space is enclosed, weatherproofed and until ambient conditions of temperature and humidity will be continuously maintained at values near those indicated for final occupancy.

PART 2 – PRODUCTS

2.01 CEILING UNITS:

A. Washable Units: Provide manufacturer's standard lay-in panels of type recommended by manufacturer for application indicated. Provide sizes shown by reflected ceiling plan or if not otherwise indicated, 24" x 48" grid-size panels, not less than 5/8" thick, with white washable finish. Shasta #2907 unperforated film

faced by Armstrong or ASTRA #1530-AST-1, non-perforated film face by BPB Capaul (Celotex) or approved equal.

B. Acoustical Units: Provide manufacturer's standard lay-in panels of type recommended by manufacturer for application indicated. Provide sizes shown by reflected ceiling plan or if not otherwise indicated, 24" x 48" grid-size panels, not less than 5/8" thick, with white finish. Cortega #769 or #823 (Fire Guard, UL Label) by Armstrong or Hytone Baroque #BET-197 or #PBT-157 (fire-rated UL Label) by BPB Celotex or approved equal.

C. Provide materials manufactured by Armstrong, USG Interiors or Celotex.

2.02 CEILING SUSPENSION MATERIALS:

A. Structural Class: Heavy duty system. Alternate intermediate duty system shall be used only where allowed by the code and regulation.

B. System Type: Either direct hung of indirect hung system at contractor's option.

C. System Manufacturer: Same as acoustical unit manufacturer or by Chicago Metallic Corp., BPB Celotex Grid, USG Interior/Donn Products, Armstrong World Industries, National Rolling Mills Co., or Roblin Building Products.

D. Finish: Manufacturer's standard baked enamel finish, white.

E. Hold Down Clips: Where required for wind uplift resistance or to achieve fire resistance rating, provide standard spring steel clips.

F. Seismic Perimeter Clips: Where 2" wall angle is required by the code and regulation (for the project assigned to Seismic Design Categories D, E and F), alternate Seismic Perimeter Clips shall be used when allowed by the governing agencies.

G. Seismic Separation Joints: Where required by the code and regulation (for the project assigned to Seismic Design Categories D, E and F), provide manufacturer's standard Seismic Separation Joint system for ceiling areas larger than 2,500 square feet.

PART 3 – EXECUTION

3.01 INSTALLATION: Install materials in accordance with manufacturer's printed instructions, and to comply with the applicable codes and governing regulations, fire-resistance rating requirements as indicated, the latest bulletin of the Acoustical Materials Association, and industry standards applicable to the Work. Where required by code and/or shown on drawings, provide lateral bracing and compression struts to resist lateral loads.

3.02 ADJUST AND CLEAN: Clean exposed surfaces of acoustical ceilings. Comply with manufacturer's instructions for cleaning and touch minor finish damage. Remove and replace the Work which cannot be successfully cleaned and repaired to permanently eliminate evidence of damage.

3.03 MAINTENANCE STOCK: At time of completing installation, deliver stock of maintenance material to the Owner. Furnish matching units installed, packaged with protective covering. Furnish not less than 1% of material installed.

END OF SECTION

(THIS PAGE INTENTIONALLY LEFT BLANK)

SECTION 09 65 00 – RESILIENT TILE FLOORING

PART 1 – GENERAL

1.01 Requirements of Division 00 and Division 01 apply to the Work of this Section.

1.02 DESCRIPTION OF WORK: Provide complete resilient flooring system and wall base.

A. Related Documents: Concrete Work is specified in Section 03 30 00 and Rough Carpentry is specified in Section 06 10 00.

1.03 SUBMITTALS:

A. Samples: Submit samples for each flooring and base specified.

1.04 QUALITY ASSURANCE: Provide each type of resilient flooring as produced by a single manufacturer, including recommended primers, adhesives, sealants, and leveling compounds.

1.05 PROJECT CONDITIONS:

A. Deliver flooring, base and installation accessories to project site in manufacturer's unopened cartons and containers each bearing names of product and manufacturer, project identification, and shipping and handling instructions.

B. Store flooring materials in dry spaces protected from the weather with ambient temperatures maintained between 50° F (10° C) and 90° F (32° C), and store tiles on flat surfaces.

C. Maintain a minimum temperature of 70° F (21° C) in spaces to receive tiles for at least 48 hours after installation. After this period, maintain a temperature of not less than 55° F (13° C).

PART 2 – PRODUCTS

2.01 MATERIALS:

A. Vinyl Composition Floor Tile: Products complying with ASTM F 1066, Composition 1 (non-asbestos formulated), 12" x 12" x 1/8".

B. Filled Vinyl Sheet with Backing: Provide vinyl sheet with plastic wear layer and fibrous backing complying with ASTM F 1303, Type II, and with RFCISV-1, Type 1, Material 1 wear layer, Group III backing suitable for USE Category 1, with a recommended static load limit of 100 psi, 72" minimum sheet width, Grade A (0.50" thick wear layer).

C. Rubber Wall Base: Provide rubber base complying with FS SS-W-40, Type 1, with matching end stops and pre-formed of molded corner units, 4" high, 1/8" gage, 100' minimum continuous length rolls and standard top-set style.

D. Resilient Stair Accessories:
1. Resilient Stair Treads: Provide treads consisting of single-piece units for width of stair and complying with FS RR-T-560, Type A, Class 2, sanded backs, style as indicated. Thickness shall not be less than 3/16" nominal and ¼" at nosing.
2. Resilient Risers: Provide single-piece riser for height and width of stair risers. Size shall be 7" cove base, 1/8" ga.
3. Resilient Stringer Skirt: Cut to match riser and tread provided and to meet wall base height, of the same material and color as base unless otherwise indicated.

E. Entry Mat: Musson fluff-cord strip tile, 3/8" thick x 12" x 12", grey tone color, or approved equal.

2.02 INSTALLATION ACCESSORIES:

A. Concrete Slab Primer: Non-staining type as recommended by flooring manufacturer.

B. Trowelable Underlayments and Patching Compounds: Latex-modified, portland-cement-based formulation provided or approved by tile flooring manufacturer for applications indicated.

C. Adhesives (Cements): Waterproof, stabilized type as recommended by tile flooring manufacturer to suit material and substrate conditions. Asphalt emulsions and other non-waterproof types not acceptable.

D. Rod for Heat-Welding Seams: Product of tile flooring manufacturer. Match field color of sheet vinyl floor covering.

PART 3 – EXECUTION

3.01 EXAMINATION:

A. General: Examine areas where installation of sheet vinyl floor coverings will occur to verify that substrates and conditions are satisfactory for installation and comply with floor covering manufacturer's printed requirements and those specified in this section.

B. Concrete Subfloors: Verify that concrete slabs comply with ASTM F 710 and that slab substrates are dry and free of curing compounds, sealers, hardeners and other

materials whose presence would interfere with bonding adhesive. Determine adhesion and dryness characteristics by performing bond and moisture tests recommended by tile flooring manufacturer. Subfloors are free of cracks, ridges, depressions, alkaline salts, scale and foreign deposits of any kind.

C. For wood subfloors verify that underlayment surface is free of surface irregularities and substances with potential to interfere with adhesive bond, show through surface, or stain sheet vinyl floor coverings.

3.02 INSTALLATION:

A. General: Comply with tile flooring manufacturer's printed installation instructions and other requirements indicated that are applicable to each type of floor covering installation included in the project. Scribe, cut and fit sheet vinyl floor coverings to butt tightly to vertical surfaces, permanent fixtures, and built-in furniture, including cabinets, pipes, outlets, edgings, thresholds and nosings. Install sheet vinyl floor coverings after other finishing, operations, including painting, have been completed.

3.03 CLEANING AND PROTECTION:

A. Remove visible adhesive and other blemishes using cleaner recommended by tile flooring manufacturer. Sweep or vacuum floor thoroughly. Do not wash floor until after period recommended by tile flooring manufacturer. Damp mop floor to remove black marks and soil.

B. Protect flooring against mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period. Use protection methods indicated or recommended by tile flooring manufacturer.

3.04 EXTRA MATERIALS: Deliver extra flooring materials to the project and store in location as directed by the Owner. Package extra materials with protective coating and with labels clearly describing contents. Provide the following amounts of each type or color installed.

A. Vinyl Composition Floor Tile: 1%, but not less than one box.

B. Filled Vinyl Sheet with Backing: 1 piece 10' x roll width.

C. Rubber Wall Base: 1 piece 10' long.

D. Resilient Stair Accessories: 2 treads and 2 risers.

E. Entry Mat: 5 tiles, 12" x 12" squares.

END OF SECTION

(PAGE INTENTIONALLY LEFT BLANK)

SECTION 09 91 00 – PAINTING

PART 1 – GENERAL

1.01 Requirements of Division 00 and Division 01 apply to the Work of this Section.

1.02 DESCRIPTION OF WORK: Provide complete interior and exterior painting and staining systems as shown on the drawings.

A. Related Documents: Lath and Plaster is specified in Section 09 24 00, Gypsum Board is specified in Section 09 29 00, and Finish Carpentry is specified in Section 06 20 00.

1.03 SUBMITTALS:

A. Samples: Submit paint samples for each color required showing color and gloss.

B. Job Site Mock-up Samples: Upon review and acceptance of samples by the Architect, the Contractor shall prepare job site mock-up as specified in 1.04 Quality Assurance.

1.04 QUALITY ASSURANCE:

A. Job Site Mock-up: The Contractor shall prepare 4’ x 8’ sample wall panel mock-up using actual materials and finishes required for final work for the Owner’s review and approval. The mock-ups shall be prepared concurrently with all other mock-ups required by the other sections of the specifications. The Contractor shall prepare all mock-ups and obtain the approval from the Owner prior to ordering any material for the project.

B. Comply with volatile-organic compound and other environmental regulations.

C. Provide primer and finish coats by the same manufacturer.

D. Test sample area for adhesion and coverage for each type of paint prior to application.

E. Painter shall have a minimum of five years experience with the materials specified.

1.05 PROJECT CONDITIONS:

A. Deliver materials to job site in original, new and unopened containers bearing manufacturer’s name and label. Store paint material where temperatures are not less than 40 degrees F and in a well ventilated area.

B. The Contractor shall be responsible for inspecting the Work of others prior to the application of any paint of finishing materials. If any surface is not in the proper condition to receive the finishing materials specified, he shall report such facts to the General Contractor and the Architect in writing or assume the responsibility for the results expected for the material and processes specified. All deficiencies or flaws which affect the painting finish, shall be repaired before application of painting materials.

C. Do not apply interior paint until space is enclosed and weatherproofed, and until ambient conditions of temperature and humidity will be continuously maintained at values near those indicated for final occupancy.

D. Paint all exposed surfaces of exterior and interior finished rooms whether or not colors are designated in "schedules", except where finish material is specifically noted. Where materials or surfaces are not specifically mentioned, paint same as adjacent similar material or surfaces. If a finish color is not designated, the Architect will select the color from standard colors available for material system specified.

E. Do not paint over any labels.

PART 2 – PRODUCTS

2.01 COLORS AND FINISHES: Provide paint colors, surface treatments, and finishes as indicated on "Schedules". Pure, non-fading color pigments of applicable types to suit substrates shall be used.

A. Provide finish coats which are compatible with prime paints used. Review other sections of these specifications in which prime paints are to be used ensure compatibility of total coating system. Provide barrier coats over non-compatible primers or remove and re-prime as required.

2.02 MANUFACTURERS:

A. Paint: ICI Dulux paints, Dunn-Edwards, Vista Paints, Sherwin Williams, Pratt and Lambert, Frazee, or approved equal.

B. Stains: Olympic Stains, California Rustic Stains, or approved equal.

2.03 INTERIOR PAINT SCHEDULE:

A. Gypsum drywall:
1. Latex PVA Sealer, one coat.
2. 100% Acrylic semigloss finish, two coats.

B. Plaster:

1. Acrylic primer, one coat.
2. 100% Acrylic semigloss finish, two coats.

C. Wood with paint finish:
1. Acrylic enamel undercoat, one coat.
2. 100% Acrylic semigloss finish, two coats.

D. Wood with stain finish:
1. Interior wood stain (AQMD compliant), one coat.
2. Interior varnish primer (AQMD compliant), one coat.
3. Interior varnish (AQMD compliant), one coat.

E. Concrete masonry units.
1. Acrylic block filler, one coat.
2. 100% Acrylic semigloss finish, two coats.

F. Concrete:
1. Acrylic masonry primer, one coat.
2. 100% Acrylic semigloss finish, two coats.

G. Ferrous metals:
1. Acrylic rust inhibiting primer, one coat.
2. 100% Acrylic semigloss finish, two coats.

2.04 EXTERIOR PAINT SCHEDULE:

A. Wood with stain finish:
1. Exterior semi-transparent stain (AQMD compliant), two coats.

B. Wood with paint finish:
1. Exterior Acrylic primer, one coat.
2. 100% Acrylic semigloss finish, two coats.

C. Concrete masonry units:
1. Acrylic masonry primer, one coat.
2. 100% Acrylic semigloss finish, two coats.

D. Concrete and Cement Plaster: Use only when indicated on ‘Exterior Colors and Finishes Schedule’ in the drawings, otherwise provide Water Repellent Wall Coatings as specified in Section 09830.
1. Acrylic masonry primer, one coat.
2. 100% Acrylic flat finish, two coats.

E. Ferrous metal:
1. Acrylic rust inhibiting primer, one coat.
2. 100% Acrylic semigloss finish, two coats.

F. Galvanized metal:
   1. Acrylic metal primer, one coat.
   2. 100% Acrylic Gloss Enamel, two coats.

PART 3 – EXECUTION

3.01 SURFACE PREPARATION: Perform preparation and cleaning procedures in accordance with paint manufacturer's instructions.

A. Remove cover plates and remove or provide surface applied protection of hardware and similar items not to be painted.

B. Scrape and clean small dry, seasoned knots and apply a thin coat of shellac or other knot sealer before application of paint. After priming, fill holes or other surface imperfections with putty of plastic woodfiller.

C. Prepare surfaces of concrete and concrete blocks by removing efflorescence, chalk, dust, dirt, etc. and by roughening as required to remove glaze.

D. Backprime all exterior trim and siding with spar varnish. Backprime interior paneling only where masonry, plaster, or other wet wall conditions occurs on backside.

E. Prime, stain, or seal wood required to be job-painted immediately upon delivery to job. Prime edges, ends, faces, undersides, and backsides of such wood, including cabinets, counters, cases and paneling.

F. Clean all metal surfaces to be painted and touch-up all damaged shop applied prime coats. Clean all galvanized surfaces with non-petroleum based solvent.

3.02 MATERIALS PREPARATION AND APPLICATION: Mix, prepare, and apply painting materials in accordance with manufacturer's instructions. Apply paint to dry, sound substrates only. Sand between coats if necessary. Apply additional coats as required until paint film is of uniform finish, color, and appearance.

3.03 CLEANUP AND PROTECTION: During process of the Work, remove discarded paint materials, rubbish, cans, and rags at the end of each work day.

A. Upon completion of painting work, clean windows glass and other paint spattered surfaces. Replace cover plates and remove temporary protection.

B. Protect the Work of other trades, whether to be painted or not against damage by painting and finish work. Correct any damage by cleaning, repairing or replacing, and repainting, as acceptable to the Architect.

END OF SECTION

SECTION 09 96 00 – WATER REPELLENT WALL COATINGS

PART 1 – GENERAL

1.01 Requirements of Division 00 and Division 01 apply to the Work of this Section.

1.02 DESCRIPTION OF WORK: Provide complete Water Repellent Wall Coating systems as shown on drawings.

A. Related Documents: Lath and Plaster is specified in Section 09 24 00, Reinforced Unit Masonry is specified in Section 04 22 00.

1.03 SUBMITTALS:

A. Product Data: Submit manufacturer's product data for each type of coating specified.

B. Samples: Submit samples for each color required showing color and gloss.

C. Job Site Mock-up Samples: Upon review and acceptance of samples by the Architects, the Contractor shall prepare job site mock-up as specified in 1.04 Quality Assurance.

1.04 QUALITY ASSURANCE:

A. Job Site Mock-up: The Contractor shall prepare 4' x 8' sample wall panel mock-up using actual materials and finishes required for final work for the Owner's review and approval. The mock-ups shall be prepared concurrently with all other mock-ups required by the other sections of the specifications. The Contractor shall prepare all mock-ups and obtain the approval from the Owner prior to ordering any material for the project.

B. Water Repellent Wall Coating Subcontractor shall possess all necessary licenses, certifications or other written approval required by the manufacturer supplying coating material.

C. The Contractor shall certify that the quantity of Water Repellent material is sufficient to meet manufacturer's minimum surface area coverage requirements for warranty application.

D. Prior to commencement of the Work, the Contractor, Water Repellent Subcontractor and Water Repellent Manufacturer's Representative shall inspect all surfaces to be treated. The Contractor shall notify manufacturer no less than 72 hours prior to inspection. All deficiencies or flaws in the substrate which affect the performance or appearance of material shall be noted in writing to the Contractor. All such deficiencies or flaws shall be repaired before application of finish.

E. The manufacturer's representative shall be present at commencement of coating application to assure utilization of proper equipment, verify material quantities and supervise the onset application of coating upon a substantial wall section which will act as a comparative standard for the remainder of the project.

1.05 PROJECT CONDITIONS:

A. Deliver materials to job site in original, new and unopened containers bearing manufacturer's name and label. Store material where temperature is between 45 to 100 degrees F and in a well ventilated area.

B. Do not apply Water Repellent Wall Coating materials until the moisture content of substrate drops below 15% and the temperature of substrate and ambient air is between 45 to 100 degrees F.

C. Do not paint over any labels.

1.06 SPECIAL PROJECT GUARANTEE: The material and workmanship involved in this application shall be guaranteed jointly and severally, under a single document to the Owner, signed by the manufacturer and applicator of materials. The Guarantee will insure performance of the system to the Owner for a period noted below from the date of substantial completion, including all labor and material to repair and replace Water Repellent Wall Coating system.

A.	"Rainguard" Blok-Lok	10 years
B.	"Rainguard" Tec-Top	10 years
C.	"Rainguard" Color-Lok and Toner Reducer	7 years

PART 2 – PRODUCTS

2.01 MANUFACTURERS: Rainguard International (888) 765-7070, or approved equal.

2.02 EXTERIOR APPLICATION SCHEDULE:

A. Concrete Masonry Units (standard grey) with elastomeric coating, flat finish:
1st coat: "Rainguard" Blok-Lok.
2nd coat: "Rainguard" Tec-Top.

B. Concrete Masonry Units (standard grey) with flat stain finish:
1st coat: "Rainguard" Color-Lok and Toner Reducer.

C. Concrete Masonry Units (integral color) with clear finish:
1st coat: "Rainguard" Blok-Lok.

D. Exterior Cement Plaster with Elastomeric Coating, flat finish:
1st coat: "Rainguard" Blok-Lok.
2nd coat: "Rainguard" Tec-Top.

PART 3 – EXECUTION

3.01 SURFACE PREPARATION:

A. Prior to application of Water Repellent Wall Coating materials allow new cement plaster and concrete masonry units to cure for a minimum of 30 days.

B. Repair all cracks, holes and construction defects prior to application of Water Repellent Coating materials as required by the manufacturer.

3.02 MATERIALS PREPARATION AND APPLICATION:

A. Mix, prepare, and apply Water Repellent Wall Coating materials in accordance with manufacturer's instructions.

B. Clear water repellent shall be applied with high volume, low pressure spray equipment. Elastomeric coating shall be applied with conventional, or airless "Mastic" spray equipment.

C. Allow 24 hours for curing between first and second coats. Backroll elastomeric material, if necessary, after application to eliminate "pinholes" in finish.

3.03 CLEANUP AND PROTECTION: During process of the Work, remove discarded Water Repellent Wall Coating materials, rubbish, cans, and rags at end of each work day.

A. Upon completion of Water Repellent Wall Coating work, clean glass and other paint spattered surfaces.

B. Protect the Work of other trades, whether to be coated or not, against damage by water Repellent Wall Coating and other finish work. Correct any damage by cleaning, repairing or replacing, and repainting, as acceptable to the Architect.

END OF SECTION

(PAGE INTENTIONALLY LEFT BLANK)

SECTION 10 21 13 – TOILET COMPARTMENTS

PART 1 – GENERAL

1.01 Requirements of Division 00 and Division 01 apply to the Work of this Section.

1.02 DESCRIPTION OF WORK: Provide stock partitions and hardware for floor-mounted toilet cubicles and wall mounted urinal screens.

A. Related Documents: Restroom Accessories are specified in Section 10 28 13 or 10 28 13.13 and Plumbing is specified in Section 22 00 00.

1.03 SUBMITTALS:

A. Product Data: Submit manufacturer's technical data for each type of partition and screen required.

B. Samples: Submit color samples for each proposed finish.

C. Shop Drawings: Furnish shop drawings indicating partition layout, swing of doors, elevations and anchorage.

1.04 QUALITY ASSURANCE:

A. Provide products of the same manufacturer for each type of toilet cubicle and wall screen.

B. Comply with the provision of applicable codes and regulations, including ADA-AG.

PART 2 – PRODUCTS

2.01 MANUFACTURERS: Bobrick, North Hollywood, CA.

2.02 MATERIALS:

A. Style of Toilet Compartments: Floor anchored and over-head braced type.

B. Style of Urinal Screens: Wall hung type.

C. Partitions Materials: Plastic Laminate with reinforced Steel Core partitions.

D. Hardware: Manufacturer's standard gravity, adjustable door-closing hinges, slide latch, combination coat hook and bumper, wall bumper for out swinging doors. Provide stainless steel tamper-proof, heavy-duty extruded aluminum brackets with screws, bolts and other anchorage devices as required.

2.03 FABRICATION: Fabricate toilet partitions minimum of 58 inches high, urinal screens minimum of 42 inches high. Provide formed and closed edges with metered and welded corners. Provide internal reinforcement for attached hardware and mark locations.

PART 3 – EXECUTION

3.01 INSPECTION: Examine substrates, previously installed inserts and anchorages necessary for mounting partitions and screens, and other conditions under which installation is to occur. Verify correct spacing and size of plumbing fixtures for ADA-AG. Do not proceed with the Work until unsatisfactory conditions have been corrected in manner acceptable to installer.

3.02 INSTALLATION: Install Restroom Accessory units in accordance with manufacturer's instructions and ADA requirements. Mount secure, plumb, level and square. Provide for adjustments of pilaster-mounted partitions with screw jack through steel saddles integral with pilaster. Conceal fastenings with stainless steel shoes.

3.03 ADJUST AND CLEAN: Adjust restroom accessories for proper operations and verify that mechanisms function smoothly. Leave ½ inch space between wall, panels and end pilaster. Adjust and align hardware to uniform clearance at vertical edges of doors not to exceed 3/16 inch. Clean and polish all exposed surfaces after removing protective coatings.

END OF SECTION

SECTION 10 28 13 – RESTROOM ACCESSORIES

PART 1 – GENERAL

1.01 Requirements of Division 00 and Division 01 apply to the Work of this Section.

1.02 DESCRIPTION OF WORK: Provide each type of restroom accessory and mounting hardware as shown on the drawings and scheduled.

A. Related Documents: Plumbing is specified in Section 22 00 00.

1.03 QUALITY ASSURANCE: Provide products of same manufacturer for each type of accessory unit and for units exposed in the same areas. Furnish inserts and anchoring devices and coordinate delivery with other Work to avoid delay.

PART 2 – PRODUCTS

2.01 MANUFACTURERS: Bobrick Washroom Equipment, Inc., Bradley Corp., and American Specialties, Inc.

2.02 SCHEDULE OF TOILET ACCESSORIES:

ITEM	BOBRICK NO	BRADLEY NO	ASI NO
Grab Bars (Satin Finish, size per drawings)	B-6806	817	3500
Toilet Paper Dispenser (at each stall)	B-2888, B-4288		
Mirrors (at each lavatory & accessible lavatory)	B-290-1830	780-1830	0600-1830
Soap Dispenser	B-4112, B-818615		

PART 3 – EXECUTION

3.01 INSPECTION: Examine substrates, previously installed inserts and anchorages necessary for mounting restroom accessories, and other conditions under which installation is to occur. Do not proceed with the Work until unsatisfactory conditions have been corrected in manner acceptable to installer.

3.02 INSTALLATION: Install restroom accessory units in accordance with manufacturer's instructions and ADA requirements.

3.03 ADJUST AND CLEAN: Adjust restroom accessories for proper operation and verify that mechanisms function smoothly. Clean and polish all exposed surfaces after removing protective coatings.

END OF SECTION

SECTION 10 28 13.13 – MULTIPLE ACCOMMODATION TOILET ROOM ACCESSORIES

PART 1 – GENERAL

1.01 Requirements of Division 00 and Division 01 apply to the Work of this Section.

1.02 DESCRIPTION OF WORK: Provide each type of toilet room accessory in public toilets and mounting hardware as shown on the drawings and scheduled.

A. Related Documents: Plumbing is specified in Section 22 00 00 and Toilet Compartments are specified in Section 10 21 13.

1.03 QUALITY ASSURANCE: Provide products of a single manufacturer for each type of accessory unit and for units exposed in the same areas. Keyed (tumbler lock) accessories shall be keyed alike with the exception of coin receiving boxes on vending equipment. Furnish inserts and anchoring devices and coordinate delivery with the other Work to avoid delay.

PART 2 – PRODUCTS

2.01 MANUFACTURER: Bobrick Washroom Equipment, Inc., 11611 Hart Street, North Hollywood, CA 91605, (818) 764-1000 or equal. Substitutions are allowed and shall be reviewed for conformance with minimum standards.

2.02 SCHEDULE OF TOILET ROOM ACCESSORIES:

A. Provide Bobrick toilet room accessories for types and locations as shown on the drawings with the model numbers as follow:
   1. Toilet paper dispenser:
      a. B-2888, B-4288, surface-mounted multi-roll toilet tissue dispenser or equal.
   2. Seat-Cover Dispenser: B-221, surface mounted seat-cover dispenser.
   3. Grab bar:
      a. B-6806 x 48” at side of toilet
      b. B-6806 x 36” at rear of toilet
   4. Sanitary napkin/tampon dispenser:
      a. B-2800.25, surface mounted
   5. Paper towel dispenser:
      a. B-72860, surface –mounted roll paper towel dispenser or equal.
   6. Waste receptacle:
      a. B-2250, Floor Standing Waste Receptacle with top or equal
   7. Soap dispenser: B-4112, B-818615 surface mounted dispenser or equal.
   8. Diaper changing station:
      a. KB-110-SSRE, recessed in 4” thick wall
      b. KB-110-SSWM, surface mounted
   9. Toilet partition hook and bumper: Manufacturer’s standard

PART 3 – EXECUTION

3.01 EXAMINATION:

A. Verify and check required wall openings for correct dimensions, required blocking, backing, frames, and necessary preparation that would affect installation of accessories.

B. Check areas to receive surface mounted units for conditions that would affect quality and execution of the Work.

C. Verify adequate spacing of plumbing fixtures and toilet partitions that affect required clearances and installation of accessories.

D. Do not proceed with installation of toilet room accessories until unsatisfactory conditions have been corrected in manner acceptable to installer.

3.02 INSTALLATION:

A. Install accessories level and plumb at locations and heights indicated, and as required to comply with the ADA and accessible code requirements. Installation methods shall be in accordance with manufacturer's recommendations. All exposed fasteners to be tamper-proof. Finish of exposed fasteners to match items.

B. Install manufacturer's recommended backing and anchoring requirements for all grab bars.

C. Conceal evidence of drilling, cutting and fitting on adjacent finishes.

D. Fit flanges of accessories and escutcheons snug to wall surfaces. Provide sealant at gaps between flanges or escutcheons and finish wall surfaces after accessories are installed.

3.03 ADJUST AND CLEAN:

A. Adjust all accessories for proper operation and verify that mechanisms function smoothly.

B. Clean and polish all exposed surfaces after removing protective coatings prior to final inspection.

C. Provide the Owner with two (2) keys with proper labels per each dispenser at the time of the final inspection.

END OF SECTION

SECTION 10 44 13 - FIRE EXTINGUISHER CABINETS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes fire protection cabinets for fire extinguishers.

1.2 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: For fire protection cabinets. Include plans, elevations, sections, details, and attachments to other work.

C. Samples: For each exposed product and for each color and texture specified.

D. Maintenance data.

1.3 QUALITY ASSURANCE

A. Fire-Rated, Fire Protection Cabinets: Listed and labeled to comply with requirements in ASTM E 814 for fire-resistance rating of walls where they are installed.

B. Coordinate size of fire protection cabinets to ensure that type and capacity of fire extinguishers indicated are accommodated.

C. Coordinate sizes and locations of fire protection cabinets with wall depths.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Cold-Rolled Steel Sheet: ASTM A 1008/A 1008M, Commercial Steel (CS), Type B.

B. Aluminum: Alloy and temper recommended by aluminum producer and manufacturer for type of use and finish indicated, and as follows:

1. Sheet: ASTM B 209 (ASTM B 209M).
2. Extruded Shapes: ASTM B 221 (ASTM B 221M).

C. Stainless-Steel Sheet: ASTM A 666, Type 304.

D. Clear Float Glass: ASTM C 1036, Type I, Class 1, Quality q3, [3] [6] mm thick.

E. Tempered Float Glass: ASTM C 1048, Kind FT, Condition A, Type I, Quality q3, 3 mm thick, Class 1 (clear).

F. Break Glass: Clear annealed float glass, ASTM C 1036, Type I, Class 1, Quality q3, 1.5 mm thick, single strength.

G. Tempered Break Glass: ASTM C 1048, Kind FT, Condition A, Type I, Quality q3, 1.5 mm thick.

2.2 FIRE PROTECTION CABINET

A. Cabinet Type: Suitable for fire extinguisher.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

a. Fire End & Croker Corporation.
b. J. L. Industries, Inc., a division of Activar Construction Products Group.
c. Kidde Residential and Commercial Division, Subsidiary of Kidde plc.
d. Larsen's Manufacturing Company.
e. Modern Metal Products, Division of Technico Inc..
f. Moon-American.
g. Potter Roemer LLC.
h. Watrous Division, American Specialties, Inc..

B. Cabinet Construction: 1-hour fire rated.

1. Fire-Rated Cabinets: Construct fire-rated cabinets with double walls fabricated from 0.0428-inch-thick, cold-rolled steel sheet lined with minimum 5/8-inch-thick, fire-barrier material. Provide factory-drilled mounting holes.

C. Cabinet Material: Steel, Aluminum or Stainless-steel sheet.

D. Recessed Cabinet: Cabinet box recessed in walls of sufficient depth to suit style of trim indicated.

1. Trimless with Concealed Flange: Surface of surrounding wall finishes flush with exterior finished surface of cabinet frame and door, without overlapping trim attached to cabinet. Provide recessed flange, of same material as box, attached to box to act as plaster stop or drywall bead.
2. Trimless with Hidden Flange: Flange of same metal and finish as box overlaps surrounding wall finish and is concealed from view by an overlapping door.

3. Exposed Flat Trim: One-piece combination trim and perimeter door frame overlapping surrounding wall surface with exposed trim face and wall return at outer edge (backbend).

E. Semi-recessed Cabinet: Cabinet box partially recessed in walls of sufficient depth to suit style of trim indicated; with one-piece combination trim and perimeter door frame overlapping surrounding wall surface with exposed trim face and wall return at outer edge (backbend). Provide where walls are of insufficient depth for recessed cabinets but are of sufficient depth to accommodate semi-recessed cabinet installation.

1. Square-Edge Trim: 1-1/4- to 1-1/2-inch backbend depth.
2. Rolled-Edge Trim: 2-1/2-inch to 4-inch backbend depth.

F. Cabinet Trim Material: Same material and finish as door.

G. Door Material: Steel sheet or Aluminum sheet

H. Door Style: Fully glazed, frameless, backless, acrylic panel, Fully glazed panel with frame or Center glass panel with frame.

I. Door Glazing: Tempered float glass (clear), Break glass, Tempered break glass.

J. Door Hardware: Manufacturer's standard door-operating hardware of proper type for cabinet type, trim style, and door material and style indicated.

K. Accessories:

1. Mounting Bracket: Manufacturer's standard steel, designed to secure fire extinguisher to fire protection cabinet, of sizes required for types and capacities of fire extinguishers indicated, with plated or baked-enamel finish.
2. Break-Glass Strike: Manufacturer's standard metal strike, complete with chain and mounting clip, secured to cabinet.
3. Door Lock: Cam lock that allows door to be opened during emergency by pulling sharply on door handle.
4. Identification: Lettering complying with authorities having jurisdiction for letter style, size, spacing, and location. Locate as required by the Agency Having Jurisdiction.

    a. Identify fire extinguisher in fire protection cabinet with the words "FIRE EXTINGUISHER."
        1) Lettering Color: Red, Black, or White, as required to provide contrast with surface lettering is applied to.

L. Finishes:

1. Manufacturer's standard baked-enamel paint for the following:

a. Exterior of cabinet, except for those surfaces indicated to receive another finish.
b. Interior of cabinet and door.

2. Aluminum: Baked enamel or powder coat.

3. Steel: Baked enamel or powder coat.

2.3 FABRICATION

A. Fire Protection Cabinets: Provide manufacturer's standard box (tub), with trim, frame, door, and hardware to suit cabinet type, trim style, and door style indicated. Miter and weld joints and grind smooth.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Examine walls and partitions for suitable framing depth and blocking where cabinets will be installed and prepare recesses as required by type and size of cabinet and trim style.

B. Install fire protection cabinets in locations and at mounting heights indicated or, if not indicated, at heights acceptable to authorities having jurisdiction.

C. Fire Protection Cabinets: Fasten cabinets to structure, square and plumb.

D. Identification: Apply decals or vinyl lettering at locations required by the authorities having jurisdiction.

E. Adjust fire protection cabinet doors to operate easily without binding. Verify that integral locking devices operate properly.

F. Replace fire protection cabinets that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION 10 44 13

SECTION 10 44 16 - FIRE EXTINGUISHERS

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes portable, hand-carried fire extinguishers.

1.2 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Operation and maintenance data.

C. Warranty: Sample of special warranty.

1.3 QUALITY ASSURANCE

A. NFPA Compliance: Fabricate and label fire extinguishers to comply with NFPA 10, "Portable Fire Extinguishers."

B. Fire Extinguishers: Listed and labeled for type, rating, and classification by an independent testing agency acceptable to authorities having jurisdiction.

C. Coordinate type and capacity of fire extinguishers with fire protection cabinets to ensure fit and function.

1.4 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace fire extinguishers that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

a. Failure of hydrostatic test according to NFPA 10.
b. Faulty operation of valves or release levers.

2. Warranty Period: Six years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 PORTABLE, HAND-CARRIED FIRE EXTINGUISHERS

A. Fire Extinguishers: Type, size, and capacity for each fire protection cabinet and mounting bracket indicated.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
2. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:

    a. Amerex Corporation.
    b. Ansul Incorporated; Tyco International Ltd.
    c. Badger Fire Protection; a Kidde company.
    d. Buckeye Fire Equipment Company.
    e. Fire End & Croker Corporation.
    f. J. L. Industries, Inc.; a division of Activar Construction Products Group.
    g. Kidde Residential and Commercial Division; Subsidiary of Kidde plc.
    h. Larsen's Manufacturing Company.
    i. Moon-American.
    j. Pem All Fire Extinguisher Corp.; a division of PEM Systems, Inc.
    k. Potter Roemer LLC.
    l. Pyro-Chem; Tyco Safety Products.

3. Instruction Labels: Include pictorial marking system complying with NFPA 10, Appendix B.

B. Stored-Pressure Water Type: UL-rated 2-A, 2.5-gal. nominal capacity, with water in stainless-steel container; with pressure-indicating gage.

C. Stored-Pressure Antifreeze Water Type: UL-rated 2-A, 2.5-gal. nominal capacity, with water and approved antifreeze solution mixed for temperatures as low as minus 40 deg F in stainless-steel container; with pressure-indicating gage.

D. Stored-Pressure Water-Mist Type: UL-rated 2-A:C, 2.5-gal. nominal capacity, with water in enameled-steel container; with pressure-indicating gage.

E. Wet-Chemical Type: UL-rated 2-A:1-B:C:K, 2.5-gal. nominal capacity, with potassium-based chemical in stainless-steel container; with pressure-indicating gage.

F. Regular Dry-Chemical Type: UL-rated with sodium bicarbonate-based dry chemical in manufacturer's standard enameled container.

G. Multipurpose Dry-Chemical Type: UL-rated with monoammonium phosphate-based dry chemical in manufacturer's standard enameled container.

H. Carbon Dioxide Type: UL-rated nominal capacity, with carbon dioxide in manufacturer's standard enameled-metal container.

I. Dry-Powder Type: UL-rated Class D, 30-lb nominal capacity, in enameled-steel container; with pressure-indicating gage.

J. Clean-Agent Type in Steel Container: UL-rated with HFC blend agent and inert material in enameled-steel container; with pressure-indicating gage.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Examine fire extinguishers for proper charging and tagging.

1. Remove and replace damaged, defective, or undercharged fire extinguishers.

B. Install fire extinguishers in locations in compliance with requirements of authorities having jurisdiction.

END OF SECTION 104416

(PAGE LEFT INTENTIONALLY BLANK)

SECTION 10 51 13 - METAL LOCKERS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Standard metal lockers.
2. Heavy-duty metal lockers.
3. Athletic metal lockers.
4. Locker benches.

1.2 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: For metal lockers. Include plans, elevations, sections, details, and attachments to other work.

C. Samples: For units with factory-applied color finishes.

D. Maintenance data.

E. Warranty: Sample of special warranty.

1.3 QUALITY ASSURANCE

A. Regulatory Requirements: Where metal lockers and benches are indicated to comply with accessibility requirements, comply with the "Americans with Disabilities Act (ADA) and Accessibility Guidelines for Buildings and Facilities".

1.4 DELIVERY, STORAGE, AND HANDLING

A. Deliver combination control charts to Owner by registered mail or overnight package service.

1.5 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of metal lockers that fail in materials or workmanship, excluding finish, within specified warranty period.

1. Warranty Period for All-Welded Metal Lockers: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Cold-Rolled Steel Sheet: ASTM A 1008/A 1008M, Commercial Steel (CS), Type B, suitable for exposed applications.

B. Metallic-Coated Steel Sheet: ASTM A 653/A 653M, Commercial Steel (CS), Type B; with A60 zinc-iron, alloy (galvannealed) coating designation.

C. Expanded Metal: ASTM F 1267, Type II (flattened), Class I, 3/4-inch steel mesh, with at least 70 percent open area.

D. Stainless-Steel Sheet: ASTM A 666, Type 304.

E. Extruded Aluminum: ASTM B 221, alloy and temper recommended by aluminum producer and manufacturer for type of use and finish indicated.

F. Steel Tube: ASTM A 500, cold rolled.

G. Particleboard: ANSI A208.1, Grade M-2.

H. Fasteners: Zinc- or nickel-plated steel, slotless-type, exposed bolt heads; with self-locking nuts or lock washers for nuts on moving parts.

I. Anchors: Material, type, and size required for secure anchorage to each substrate.

1. Provide nonferrous-metal or hot-dip galvanized anchors and inserts on inside face of exterior walls for corrosion resistance.
2. Provide toothed-steel or lead expansion sleeves for drilled-in-place anchors.

2.2 STANDARD METAL LOCKERS

A. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

1. BASIS OF DESIGN: ASI Storage Solutions Inc.; Traditional Collection, single-tier, 18” x 18” x 72” tall with interior shelf and coat hooks.
2. DeBourgh Mfg. Co.; Worley Lockers.
3. General Storage Systems Ltd.
4. Hadrian Manufacturing Inc.; Emperor Lockers.
5. List Industries Inc..
6. Lyon Workspace Products, LLC; Standard Lockers.
7. Penco Products, Inc..
8. Republic Storage Systems Company.
9. Shanahan's Manufacturing Limited; Deluxe Series Lockers.
10. Tennsco Corp.; Tennsco Lockers.

B. Locker Arrangement: As indicated on Drawings.

C. Material: Cold-rolled steel sheet.

D. Body and Shelves: Assembled by riveting or bolting body components together. Fabricate from unperforated 0.024-inch nominal-thickness steel sheet.

E. Frames: Channel formed; fabricated from 0.060-inch nominal-thickness steel sheet; lapped and factory welded at corners; with top and bottom main frames factory welded into vertical main frames. Form continuous, integral door strike full height on vertical main frames.

F. Doors: One piece; fabricated from 0.060-inch nominal-thickness steel sheet; formed into channel shape with double bend at vertical edges and with right-angle single bend at horizontal edges.

1. Doors less than 12 inches wide may be fabricated from 0.048-inch nominal-thickness steel sheet.
2. Doors for box lockers less than 15 inches wide may be fabricated from 0.048-inch nominal-thickness steel sheet.
3. Reinforcement: Manufacturer's standard reinforcing angles, channels, or stiffeners for doors more than 15 inches wide; welded to inner face of doors.
4. Stiffeners: Manufacturer's standard full-height stiffener fabricated from 0.048-inch nominal-thickness steel sheet; welded to inner face of doors.
5. Sound-Dampening Panels: Manufacturer's standard, designed to stiffen doors and reduce sound levels when doors are closed, of die-formed metal with full perimeter flange and sound-dampening material; welded to inner face of doors.
6. Door Style: Louvered vents at top and bottom.

G. Hinges: Welded to door and attached to door frame with no fewer than two factory-installed rivets per hinge that are completely concealed and tamper resistant when door is closed; fabricated to swing 180 degrees.

1. Knuckle Hinges: Steel, full loop, five or seven knuckles, tight pin; minimum 2 inches high. Provide no fewer than three hinges for each door more than 42 inches high.
2. Continuous Hinges: Manufacturer's standard, steel, full height.

H. Recessed Door Handle and Latch: Stainless-steel cup with integral door pull, recessed so locking device does not protrude beyond face of door; pry and vandal resistant.

1. Multipoint Latching: Finger-lift latch control designed for use with built-in combination locks, built-in key locks, or padlocks; positive automatic latching and prelocking.

a. Latch Hooks: Equip doors 48 inches and higher with three latch hooks and doors less than 48 inches high with two latch hooks; fabricated from 0.105-inch nominal-thickness steel sheet; welded or riveted to full-height door strikes; with resilient silencer on each latch hook.
b. Latching Mechanism: Manufacturer's standard, rattle-free latching mechanism and moving components isolated with vinyl or nylon to prevent metal-to-metal contact, and incorporating a prelocking device that allows locker door to be locked while door is open and then closed without unlocking or damaging lock or latching mechanism.

2. Single-Point Latching: Nonmoving latch hook designed to engage bolt of built-in combination or cylinder lock.

a. Latch Hook: Equip each door with one latch hook, fabricated from 0.105-inch nominal-thickness steel sheet; welded midway up full-height door strike; with resilient silencer.

I. Door Handle and Latch for Lockers: Stainless-steel strike plate with integral pull; with steel padlock loop that projects through metal locker door.

J. Combination Padlocks: Provided by Owner.

K. Built-in Combination Locks: Key-controlled, three-number dialing combination locks; capable of at least five combination changes made automatically with a control key.

1. Bolt Operation: Manually locking deadbolt or automatically locking spring bolt.

L. Equipment: Equip each metal locker with identification plate and the following unless otherwise indicated:

1. Single-Tier Units: Shelf, one double-prong ceiling hook, and two single-prong wall hooks. Provide a minimum of one locker compliant with ADA standards per set of lockers, ADA compliant lockers shall be adequately identified.
2. Coat Rods: For each compartment of single-tier, double-tier, and triple-tier metal lockers.

M. Accessories:

1. Legs: 6 inches high; formed by extending vertical frame members, or fabricated from 0.075-inch nominal-thickness steel sheet; welded to bottom of locker.

    a. Closed Front and End Bases: Fabricated from 0.036-inch nominal-thickness steel sheet.

2. Continuous Zee Base: Fabricated from manufacturer's standard thickness, but not less than 0.060-inch nominal-thickness steel sheet.

    a. Height: 4 inches.

3. Continuous Sloping Tops: Fabricated from manufacturer's standard thickness, but not less than 0.036-inch nominal-thickness steel sheet.

4. Individual Sloping Tops: Fabricated from 0.024-inch nominal-thickness steel sheet.
5. Recess Trim: Fabricated from 0.048-inch nominal-thickness steel sheet.
6. Filler Panels: Fabricated from manufacturer's standard thickness, but not less than 0.036-inch nominal-thickness steel sheet.
7. Boxed End Panels: Fabricated from 0.060-inch nominal-thickness steel sheet.
8. Finished End Panels: Fabricated from 0.024-inch nominal-thickness steel sheet.

N. Finish: Baked enamel or powder coat.

O. Color: Red #45 for lockers on the Fire Station side of the building, Pineforest #53 for lockers located on the Sherriff’s Office side of the building.

2.3 HEAVY-DUTY METAL LOCKERS

A. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:

1. Art Metal Products.
2. DeBourgh Mfg. Co.; Sentry Corridor/Personnel Lockers.
3. List Industries Inc.; Marquis Protector.
4. Lyon Workspace Products, LLC.
5. Penco Products, Inc.

B. Locker Arrangement: As indicated on Drawings.

C. Material: Cold-rolled steel sheet.

D. Body: Assembled by welding body components together. Fabricate from unperforated steel sheet with 0.048-inch nominal-thickness backs and 0.060-inch nominal-thickness tops, bottoms, sides, and shelves.

E. Frames: Channel formed; fabricated from 0.060-inch nominal-thickness steel sheet; lapped and factory welded at corners; with top and bottom main frames factory welded into vertical main frames. Form continuous, integral door strike full height on vertical main frames.

F. Doors: One piece; fabricated from 0.075-inch nominal-thickness steel sheet; formed into channel shape with double bend at vertical edges and with right-angle single bend at horizontal edges.

1. Reinforcement: Manufacturer's standard reinforcing angles, channels, or stiffeners for doors more than 15 inches wide; welded to inner face of doors.
2. Door Style: Louvered vents at top and bottom.

G. Hinges: Welded to door and attached to door frame with no fewer than two factory-installed rivets per hinge that are completely concealed and tamper resistant when door is closed; fabricated to swing 180 degrees.

1. Knuckle Hinges: Steel, full loop, five or seven knuckles, tight pin; minimum 2 inches high. Provide no fewer than three hinges for each door more than 42 inches high.
2. Continuous Hinges: Manufacturer's standard, steel, full height.

H. Recessed Door Handle and Latch: Stainless-steel cup with integral door pull, recessed so locking device does not protrude beyond face of door; pry and vandal resistant.

1. Multipoint Latching: Finger-lift latch control designed for use with built-in combination locks or padlocks; positive automatic latching and prelocking.

    a. Latch Hooks: Equip doors 48 inches and higher with three latch hooks and doors less than 48 inches high with two latch hooks; fabricated from 0.120-inch nominal-thickness steel sheet; welded to full-height door strikes; with resilient silencer on each latch hook.
    b. Latching Mechanism: Manufacturer's standard, rattle-free latching mechanism and moving components isolated to prevent metal-to-metal contact, and incorporating a prelocking device that allows locker door to be locked while door is open and then closed without unlocking or damaging lock or latching mechanism.

2. Single-Point Latching: Nonmoving latch hook designed to engage bolt of built-in combination or with steel padlock loop that projects through recessed cup and is finished to match metal locker body.

a. Latch Hook: Equip each door with one latch hook, fabricated from 0.120-inch nominal-thickness steel sheet; welded midway up full-height door strike; with resilient silencer.

I. Combination Padlocks: Provided by Owner.

J. Built-in Combination Locks: Key-controlled, three-number dialing combination locks; capable of at least five combination changes made automatically with a control key.

1. Bolt Operation: Manually locking deadbolt or automatically locking spring bolt.

K. Equipment: Equip each metal locker with identification plate and the following unless otherwise indicated:

1. Single-Tier Units: Shelf, one double-prong ceiling hook, and two single-prong wall hooks.
2. Double-Tier Units: One double-prong ceiling hook and two single-prong wall hooks.
3. Triple-Tier Units: One double-prong ceiling hook.
4. Coat Rods: For each compartment of single-tier, double-tier, and triple-tier metal lockers.

L. Accessories:

1. Legs: 6 inches high; formed by extending vertical frame members, or fabricated from 0.075-inch nominal-thickness steel sheet; welded to bottom of locker.

a. Closed Front and End Bases: Fabricated from 0.036-inch nominal-thickness steel sheet.

2. Continuous Zee Base: Fabricated from, manufacturer's standard thickness, but not less than 0.060-inch nominal-thickness steel sheet.

a. Height: 4 inches.

3. Continuous Sloping Tops: Fabricated from 0.048-inch nominal-thickness steel sheet, with a pitch of approximately 20 degrees.

4. Recess Trim: Fabricated from 0.048-inch nominal-thickness steel sheet.
5. Filler Panels: Fabricated from 0.048-inch nominal-thickness steel sheet.
6. Boxed End Panels: Fabricated from 0.048-inch nominal-thickness steel sheet.

M. Finish: Baked enamel or powder coat.

N. Color: Red #45 for lockers on the Fire Station side of the building, Pineforest #53 for lockers located on the Sherriff’s Office side of the building.

2.4 LOCKER BENCHES

A. Provide bench units with overall assembly height of 17-1/2 inches.

B. Bench Tops: Manufacturer's standard one-piece units, with rounded corners and edges.

1. Size: Minimum 9-1/2 inches wide by 1-1/4 inches thick except provide minimum 20-inch-wide tops where accessible benches are indicated.
2. Laminated clear hardwood with one coat of clear sealer on all surfaces and one coat of clear lacquer on top and sides.

C. Fixed Pedestals: Manufacturer's standard supports, with predrilled fastener holes for attaching bench top and anchoring to floor, complete with fasteners and anchors, and as follows:

1. Tubular Steel: 1-1/4-inch-diameter steel tubing, with 0.1265-inch-thick steel flanges welded at top and base; with baked-enamel or zinc-plated finish; anchored with exposed fasteners.

D. Freestanding Pedestals: Manufacturer's standard supports, with predrilled fastener holes for attaching bench top, complete with fasteners, and as follows:

1. Aluminum: 1/8-inch-thick by 3-inch-wide channel or 1/4-inch-thick by 3-inch-wide bar stock, shaped into trapezoidal or inverted-T form; with nonskid pads at bottom.
2. Stainless Steel: 1/8-inch-thick by 3-inch-wide channel or 1/4-inch-thick by 3-inch-wide bar stock, shaped into trapezoidal form; with nonskid pads at bottom. Add finish.

2.5 FABRICATION

A. Fabricate metal lockers square, rigid, and without warp and with metal faces flat and free of dents or distortion. Make exposed metal edges safe to touch and free of sharp edges and burrs.

1. Form body panels, doors, shelves, and accessories from one-piece steel sheet unless otherwise indicated.
2. Provide fasteners, filler plates, supports, clips, and closures as required for complete installation.

B. Fabricate each metal locker with an individual door and frame; individual top, bottom, and back; and common intermediate uprights separating compartments. Factory weld frame members of each metal locker together to form a rigid, one-piece assembly.

C. Knocked-Down Construction: Fabricate metal lockers using nuts, bolts, screws, or rivets for nominal assembly at Project site or preassembly at plant prior to shipping.

D. All-Welded Construction: Factory preassemble metal lockers by welding all joints, seams, and connections; with no bolts, nuts, screws, or rivets used in assembly of main locker groups. Factory weld main locker groups into one-piece structures. Grind exposed welds flush.

E. Accessible Lockers: Fabricate as follows:

1. Locate bottom shelf no lower than 15 inches above the floor.
2. Where hooks, coat rods, or additional shelves are provided, locate no higher than 48 inches above the floor.

F. Hooks: Manufacturer's standard ball-pointed type, aluminum or steel; zinc plated.

G. Coat Rods: Fabricated from 1-inch-diameter steel.

H. Identification Plates: Manufacturer's standard, etched, embossed, or stamped aluminum or plastic plates, with numbers and letters at least 3/8 inch high.

I. Continuous Base: Formed into channel or zee profile for stiffness, and fabricated in lengths as long as practical to enclose base and base ends of metal lockers; finished to match lockers.

J. Continuous Sloping Tops: Fabricated in lengths as long as practical, without visible fasteners at splice locations; finished to match lockers.

1. Sloping-top corner fillers, mitered.

K. Individual Sloping Tops: Fabricated in width to fit one locker frame in lieu of flat locker tops; with integral back; finished to match lockers. Provide wedge-shaped divider panels between lockers.

L. Recess Trim: Fabricated with minimum 2-1/2-inch face width and in lengths as long as practical; finished to match lockers.

M. Filler Panels: Fabricated in an unequal leg angle shape; finished to match lockers. Provide slip-joint filler angle formed to receive filler panel.

N. Boxed End Panels: Fabricated with 1-inch- wide edge dimension, and designed for concealing fasteners and holes at exposed ends of non-recessed metal lockers; finished to match lockers.

1. Provide one-piece panels for double-row (back-to-back) locker ends.

O. Finished End Panels: Designed for concealing unused penetrations and fasteners, except for perimeter fasteners, at exposed ends of nonrecessed metal lockers; finished to match lockers.

1. Provide one-piece panels for double-row (back-to-back) locker ends.

P. Center Dividers: Full-depth, vertical partitions between bottom and shelf; finished to match lockers.

2.6 STEEL SHEET FINISHES

A. Baked-Enamel Finish: Immediately after cleaning, pretreating, and phosphatizing, apply manufacturer's standard thermosetting baked-enamel finish. Comply with paint manufacturer's written instructions for application, baking, and minimum dry film thickness.

B. Powder-Coat Finish: Immediately after cleaning and pretreating, electrostatically apply manufacturer's standard, baked-polymer, thermosetting powder finish. Comply with resin manufacturer's written instructions for application, baking, and minimum dry film thickness.

PART 3 - EXECUTION

3.1 INSTALLATION

A. General: Install level, plumb, and true; shim as required, using concealed shims.

1. Anchor locker runs at ends and at intervals recommended by manufacturer, but not more than 36 inches o.c. Using concealed fasteners, install anchors through backup reinforcing plates, channels, or blocking as required to prevent metal distortion.
2. Anchor single rows of metal lockers to walls near top and bottom of lockers.
3. Anchor back-to-back metal lockers to floor.

B. Knocked-Down Metal Lockers: Assemble with standard fasteners, with no exposed fasteners on door faces or face frames.

C. All-Welded Metal Lockers: Connect groups together with standard fasteners, with no exposed fasteners on face frames.

D. Equipment and Accessories: Fit exposed connections of trim, fillers, and closures accurately together to form tight, hairline joints, with concealed fasteners and splice plates.

1. Attach hooks with at least two fasteners.
2. Attach door locks on doors using security-type fasteners.
3. Identification Plates: Identify metal lockers with identification indicated on Drawings.
    a. Attach plates to each locker door, near top, centered, with at least two aluminum rivets.

4. Attach recess trim to recessed metal lockers with concealed clips.
5. Attach filler panels with concealed fasteners. Locate filler panels where indicated on Drawings.
6. Attach sloping-top units to metal lockers, with closures at exposed ends.
7. Attach boxed end panels with concealed fasteners to conceal exposed ends of non-recessed metal lockers.
8. Attach finished end panels with fasteners only at perimeter to conceal exposed ends of nonrecessed metal lockers.

E. Fixed Locker Benches: Provide no fewer than two pedestals for each bench, uniformly spaced not more than 72 inches apart. Securely fasten tops of pedestals to undersides of bench tops, and anchor bases to floor.

F. Freestanding Locker Benches: Place benches in locations indicated on Drawings.

END OF SECTION 10 51 13

PAGE INTENTIONALLY LEFT BLANK

SECTION 113100 - APPLIANCES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Cooking appliances.
2. Kitchen exhaust ventilation.
3. Refrigeration appliances.
4. Cleaning appliances.
5. Trash compactors.

1.2 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Samples: For each exposed product and for each color and texture.

C. Product certificates.

D. Field quality-control reports.

E. Operation and maintenance data.

F. Warranties: Sample of special warranties.

1.3 QUALITY ASSURANCE

A. Installer Qualifications: An employer of workers trained and approved by manufacturer for installation and maintenance of units required for this Project.

1.4 WARRANTY

A. Special Warranties: Manufacturer's standard form in which manufacturer agrees to repair or replace residential appliances or components that fail in materials or workmanship within specified warranty period.

1. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

B. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated or comparable product by one of the following:

1. Amana; a division of Whirlpool Corporation.
2. ASKO North America; a division of AM Appliance Group.
3. BOSCH Home Appliances.
4. BSH Home Appliances Corporation (Gaggenau).
5. BSH Home Appliances Corporation (Thermador).
6. Dacor, Inc.
7. Dynamic Cooking Systems, Inc.; a subsidiary of Fisher & Paykel Appliances Holdings Limited.
8. Electrolux Home Products (Frigidaire).
9. Fisher & Paykel.
10. General Electric Company (GE).
11. General Electric Company (Hotpoint).
12. Jade Home Products Company.
13. Jenn-Air; a division of Whirlpool Corporation.
14. KitchenAid; a division of Whirlpool Corporation.
15. LG Appliances.
16. Maytag; a division of Whirlpool Corporation.
17. Miele, Inc.
18. Samsung.
19. Sears Brands LLC (Kenmore).
20. Sharp Electronics Corp.
21. Sub-Zero, Inc.
22. Thor Appliance Company.
23. Viking Range Corporation.
24. Whirlpool Corporation.
25. Wolf Appliance, Inc.

2.2 RANGES

A. Electric Range: Slide-in range with one oven and complying with AHAM ER-1.
1. Electric Burner Elements: Four burners.
2. Anti-Tip Device: Manufacturer's standard.
3. Material: Stainless steel with manufacturer's standard cooktop.

2.3 MICROWAVE OVENS

A. Microwave Oven:
   1. Capacity: 2.2 cu. ft.
   2. Mounting: Undercabinet
   3. Microwave Power Rating: Manufacturer's standard
   4. Material: Stainless steel

2.4 KITCHEN EXHAUST VENTILATION

A. Overhead Exhaust Hood:
   1. Basis-of-Design Product: Indicated on Drawings.
   2. Type: Wall-mounted exhaust-hood system
   3. Exhaust Fan: Built into hood and with manufacturer's standard capacity.

      a. Venting: Vented to outside through roof.

   4. Finish: Stainless steel.

2.5 REFRIGERATOR/FREEZERS

A. Refrigerator/Freezer: Two-door, side-by-side refrigerator/freezer or Two-door refrigerator/freezer with freezer on bottom and complying with AHAM HRF-1.

   1. Type: Freestanding
   2. Storage Capacity: 28.5 cu. ft.

   3. General Features:

      a. Dispenser in door for ice and cold water.
      b. Interior light in refrigeration compartment.
      c. Automatic defrost.
      d. Interior light in freezer compartment.
      e. Automatic icemaker and storage bin.

   4. Energy Performance, ENERGY STAR: Provide appliances that qualify for the EPA/DOE ENERGY STAR product labeling program.

2.6 DISHWASHERS

A. Dishwasher: Complying with AHAM DW-1 and ASSE 1006.

   1. Type: Built-in undercounter.
   2. Energy Performance, ENERGY STAR: Provide appliances that qualify for the EPA/DOE ENERGY STAR product labeling program.

3. Front Panel: Stainless steel.

2.7 CLOTHES WASHERS AND DRYERS

A. Clothes Washer: Complying with ASSE 1007.
1. Type: Freestanding or Stacking, front-loading unit.
2. Capacity: 5.2 cu. ft..
3. Pedestal: Manufacturer's standard height laundry pedestal with storage drawer, matching appliance finish.
4. Energy Performance, ENERGY STAR: Provide appliances that qualify for the EPA/DOE ENERGY STAR product labeling program.
5. Water-Efficient Clothes Washer: Provide clothes washer with modified energy factor greater than or equal to 2.0 and water factor less than 5.5.
6. Appliance Finish: Stainless steel.
7. Front-Panel Finish: Stainless steel.

B. Clothes Dryer: Complying with AHAM HLD-1.
1. Type: Freestanding or Stacking, frontloading, electric unit.
2. Capacity: 8.0 cu. ft..
3. Features:

a. Interior drum light.
b. Stacking kit to stack dryer over washer.
c. Pedestal: Manufacturer's standard height laundry pedestal with storage drawer, matching appliance finish.

4. Appliance Finish: Stainless steel.
5. Front-Panel Finish: Stainless steel.

2.8 In Sink Garbage Disposal Unit:

A. Garbage Disposal Unit:

1. Basis-of-Design Product: InSinkErator SS-100 or Equal.
2. Motor Size: 1 HP.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Built-in Equipment: Securely anchor units to supporting cabinets or countertops with concealed fasteners. Verify that clearances are adequate for proper functioning and that rough openings are completely concealed.

B. Freestanding Equipment: Place units in final locations after finishes have been completed in each area. Verify that clearances are adequate to properly operate equipment.

C. Range Anti-Tip Device: Install at each range according to manufacturer's written instructions.

D. Utilities: See Divisions 22 and 26 for plumbing and electrical requirements.

3.2 FIELD QUALITY CONTROL

A. Perform tests and inspections.

1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.

B. Tests and Inspections:

1. Perform visual, mechanical, and electrical inspection and testing for each appliance according to manufacturers' written recommendations. Certify compliance with each manufacturer's appliance-performance parameters.
2. Leak Test: After installation, test for leaks. Repair leaks and retest until no leaks exist.
3. Operational Test: After installation, start units to confirm proper operation.
4. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and components.

C. Prepare test and inspection reports.

END OF SECTION 11 31 00

(THIS PAGE INTENTIONALLY LEFT BLANK)

SECTION 123530 - CASEWORK

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Kitchen cabinets.

2. Miscellaneous built in casework.

1.2 SUBMITTALS

A. Product Data: For the following:

1. Cabinets.
2. Cabinet hardware.

B. Shop Drawings: For cabinets and countertops. Include plans, elevations, details, and attachments to other work. Show materials, finishes, filler panels, hardware, edge and backsplash profiles, methods of joining countertops, and cutouts for plumbing fixtures.

C. Samples: For each type of material exposed to view.

D. Qualification Data: For qualified manufacturer.

1.3 QUALITY ASSURANCE

A. Manufacturer Qualifications: Obtain cabinets from a manufacturer that is certified for chain of custody by an FSC-accredited certification body.

PART 2 - PRODUCTS

2.1 CABINETS

A. Quality Standard: Provide cabinets that comply with KCMA A161.1.

1. KCMA Certification: Provide cabinets with KCMA's "Certified Cabinet" seal affixed in a semiexposed location of each unit and showing compliance with the above standard.

B. Face Style: Full overlay or Partial overlay.

C. Cabinet Style: Face frame

D. Door and Drawer Fronts: Solid-wood stiles and rails, 5/8 inch thick, with 3/4-inch-thick, solid-wood center panels.

E. Face Frames: 3/4-by-1-5/8-inch solid wood.

F. Exposed Cabinet End Finish: Wood veneer.

2.2 CABINET MATERIALS

A. General:

1. All Materials and adhesives shall be in compliance with CalGreen and CBC requirements.

2. Certified Wood Materials: Fabricate cabinets with wood and wood-based products produced from wood obtained from forests certified by an FSC-accredited certification body to comply with FSC STD-01-001, "FSC Principles and Criteria for Forest Stewardship."
3. Adhesives and Composite Wood and Agrifiber Products: Do not use products that contain urea formaldehyde.
4. Adhesives: Use adhesives that comply with the product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers," including 2004 Addenda.
5. Composite Wood and Agrifiber Products: Provide products that comply with the product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers," including 2004 Addenda.
6. Hardwood Lumber: Kiln dried to 7 percent moisture content.
7. Softwood Lumber: Kiln dried to 10 percent moisture content.
8. Hardwood Plywood: HPVA HP-1, made with adhesive containing no urea formaldehyde.
9. Particleboard: ANSI A208.1, Grade M-2, made with binder containing no urea formaldehyde.
10. Medium-Density Fiberboard: ANSI A208.2, Grade MD, made with binder containing no urea formaldehyde.
11. Hardboard: ANSI A135.4, Class 1 Tempered.

B. Exposed Materials:

1. Exposed Wood Species: Maple or Manufacturer's standard domestic hardwood species.

a. Select materials for compatible color and grain. Do not use two adjacent exposed surfaces that are noticeably dissimilar in color, grain, figure, or natural character markings.
b. Staining and Finish: As selected by Architect from manufacturer's full range.

2. Solid Wood: Clear hardwood lumber of species indicated, free of defects.
3. Plywood: Hardwood plywood with face veneer of species indicated, with Grade A faces and Grade C backs of same species as faces.

C. Semi-exposed Materials: Unless otherwise indicated, provide the following:

1. Solid Wood: Sound hardwood lumber, selected to eliminate appearance defects. Same species as exposed surfaces or stained to be compatible with exposed surfaces.
2. Plywood: Hardwood plywood with Grade C faces and not less than Grade 3 backs of same species as faces. Face veneers of same species as exposed surfaces or stained to be compatible with exposed surfaces.

D. Concealed Materials: Solid wood or plywood, of any hardwood or softwood species, with no defects affecting strength or utility; particleboard; medium-density fiberboard; or hardboard.

2.3 CABINET HARDWARE

A. General: Manufacturer's standard units complying with BHMA A156.9, of type, size, style, material, and finish as selected by Architect from manufacturer's full range.

B. Pulls: Back-mounted decorative pulls with backing plates.

C. Hinges: Concealed European-style self-closing hinges.

D. Drawer Guides: Epoxy-coated-metal, self-closing drawer guides; designed to prevent rebound when drawers are closed; with nylon-tired, ball-bearing rollers; and complying with BHMA A156.9, Type B05011 or B05091.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install cabinets with no variations in flushness of adjoining surfaces; use concealed shims. Where cabinets abut other finished work, scribe and cut for accurate fit. Provide filler strips, scribe strips, and moldings in finish to match cabinet face.

B. Install cabinets without distortion so doors and drawers fit openings, are aligned, and are uniformly spaced. Complete installation of hardware and accessories as indicated.

C. Install cabinets and countertop level and plumb to a tolerance of 1/8 inch in 8 feet.

D. Fasten cabinets to adjacent units and to backing.

1. Fasten wall cabinets through back, near top and bottom, at ends and not less than 24 inches o.c. with No. 10 wafer-head screws sized for 1-inch penetration into wood framing, blocking, or hanging strips.
2. Fasten wall cabinets through back, near top and bottom, at ends and not less than 24 inches o.c., with toggle bolts through metal backing behind gypsum board.

E. Fasten plastic-laminate countertops by screwing through corner blocks of base units into underside of countertop. Form seams using splines to align adjacent surfaces, and secure with glue and concealed clamping devices designed for this purpose.

F. Adjust cabinets and hardware so doors and drawers are centered in openings and operate smoothly without warp or bind. Lubricate operating hardware as recommended by manufacturer.

END OF SECTION 123530

SECTION 12 36 61 - SIMULATED STONE COUNTERTOPS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Cultured marble countertops and backsplashes.
2. Solid-surface-material countertops and backsplashes.
3. Quartz agglomerate countertops and backsplashes.

1.2 SUBMITTALS

A. Product Data: For countertop materials and sinks.

B. Shop Drawings: For countertops. Show materials, finishes, edge and backsplash profiles, methods of joining, and cutouts for plumbing fixtures.

C. Samples: For each type of material exposed to view.

PART 2 - PRODUCTS

2.1 CULTURED MARBLE COUNTERTOPS

A. Configuration: Provide countertops with the following front and backsplash style:

1. Front: Radius edge with apron, 2 inches high with 3/8-inch.
2. Backsplash: Straight, with 3/8-inch radius cove and slightly eased at top.
3. Endsplash: Matching backsplash.

B. Fabrication: Fabricate tops in one piece with integral sink bowls and backsplashes.

2.2 SOLID-SURFACE-MATERIAL COUNTERTOPS

A. Configuration: Provide countertops with the following front and backsplash style:

1. Front: Radius edge with apron, 2 inches high with 3/8-inch radius
2. Backsplash: Straight, slightly eased at corner.
3. Endsplash: Matching backsplash.

B. Countertops: 3/4-inch- thick, solid surface material with front edge built up with same material.

C. Backsplashes: 3/4-inch- thick, solid surface material.

2.3 QUARTZ AGGLOMERATE COUNTERTOPS

A. Configuration: Provide countertops with the following front and backsplash style:

1. Front: Radius edge with apron, 2 inches high with 3/8-inch radius.
2. Backsplash: Straight, slightly eased at corner.
3. Endsplash: Matching backsplash.

B. Countertops: 3/4-inch- thick, quartz agglomerate with front edge built up with same material.

C. Backsplashes: 3/4-inch- thick, quartz agglomerate.

2.4 COUNTERTOP MATERIALS

A. Certified Wood Materials: Fabricate countertops with wood and wood-based products produced from wood obtained from forests certified by an FSC-accredited certification body to comply with FSC STD-01-001, "FSC Principles and Criteria for Forest Stewardship."

B. Composite Wood and Agrifiber Products: Provide products that comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers," including 2004 Addenda.

C. Particleboard: ANSI A208.1, made with binder containing no urea formaldehyde.

D. Plywood: Exterior softwood plywood complying with DOC PS 1, Grade C-C Plugged, touch sanded.

E. Adhesives: Use adhesives that comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers," including 2004 Addenda.

F. Cultured Marble: Gel-coated solid fabrication of filled plastic resin complying with ANSI Z124.3, Type 4, with precoated finish, and not less than 1/2 inch thick.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

    a. Bathroom World Manufacturing Company.
    b. Cameo Marble.
    c. Cherry Marble Group.
    d. Comar Products, Inc.
    e. Craig Baker Marble Co., Inc.
    f. Cultured Marble Products.
    g. Custom Marble Products.
    h. Custom Marble Products, Inc.
    i. Imperial Marble Corp.
    j. Marbleon, Inc.
    k. MarCraft, Inc.
    l. Princess Marble.
    m. Roma Marble, Inc.
    n. Rynone Manufacturing Corp.
    o. Tiffany Marble.

2. Colors and Patterns: As selected by Architect from manufacturer's full range.

G. Solid Surface Material: Homogeneous solid sheets of filled plastic resin complying with ANSI SS1.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

    a. Avonite Surfaces.
    b. E. I. du Pont de Nemours and Company.
    c. Formica Corporation.
    d. LG Chemical, Ltd.
    e. Meganite Inc.
    f. Samsung Chemical USA, Inc.
    g. Swan Corporation (The).
    h. Transolid, Inc.
    i. Wilsonart International.

2. Type: Provide Standard Type unless Special Purpose Type is indicated.
3. Integral Sink Bowls: Comply with ISSFA-2 and ANSI Z124.3, Type 5 or Type 6, without a precoated finish.
4. Colors and Patterns: As selected by Architect from manufacturer's full range.

H. Quartz Agglomerate: Solid sheets consisting of quartz aggregates bound together with a matrix of filled plastic resin and complying with the "Physical Characteristics of Materials" Article of ANSI SS1.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. Cambria.
b. Cosentino USA.
c. E. I. du Pont de Nemours and Company.
d. LG Chemical, Ltd.
e. Meganite Inc.
f. Samsung Chemical USA, Inc.
g. Technistone USA, Inc.
h. Transolid, Inc.

2. Colors and Patterns: As selected by Architect from manufacturer's full range.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Fasten countertops by screwing through corner blocks of base units into underside of countertop. Align adjacent surfaces and, using adhesive in color to match countertop, form seams to comply with manufacturer's written instructions. Carefully dress joints smooth, remove surface scratches, and clean entire surface.

END OF SECTION 123661

SECTION 12 93 00 – MISCELLANEOUS SITEWORK ITEMS

PART 1 – GENERAL

1.01 Requirements of Division 00 and Division 01 apply to the Work of this Section.

1.02 DESCRIPTION OF WORK: Provide pipe guards and trash receptacles shown on drawings.

A. Related Documents: Asphalt Paving is specified in Section 32 12 00 and Site Concrete is specified in Section 03 30 00.

1.03 SUBMITTALS:

A. Product Data: Submit product data for each item.

1.04 QUALITY ASSURANCE: Verify field conditions prior to installation.

PART 2 – PRODUCTS

2.01 MATERIALS:

A. Steel Pipe: ASTM A 53 grade “B”.

B. Trash Receptacles: Pre-cast concrete, 33” high x 25” diameter, weight 452 lbs, with 28 gallon capacity. Provide complete with poly bag liner, retaining ring and anodized aluminum round funnel.

C. Bicycle Racks: Manufacture from 2 3/8” O.D. Schedule 40 steel pipe. Furnish in manufacturer’s standard sizes. Refer to drawings for number of stalls.

D. Bicycle Lockers: Class I, 2 doors with 2 bike capacity. Manufactured from colored fiberglass reinforced plastic with OSB core and aluminum extrusions for durability. Graffiti, impact and scratch resistant. Equipped with internal locking hardware and zinc plated fasteners and assembly hardware.

2.02 MANUFACTURERS:

A. Trash Receptacles: “California QR-CAL2533W” by Quick Crete Products, Corp., Manufacturer’s standard color and finish to be selected by the Architect, 731 Parkridge Avenue, Norco, CA 92860, (951) 737-6240.

B. Bicycle Racks:
1. “Wave-Lok” by Sunshine U-Lok, 31316 Via Colinas, Ste. 102, Westlake Village, CA 91362, (818) 707-0110.

2. "Rolling Rack" Standard Bike Rack by American Bicycle Security Co., Powder coat finish, color to be selected by the Architect, P.O. Box 7359 Ventura, CA 93006, (800) 245-3723 / (805) 933-3688.
3. "BR Plus" Series by Huntco Supply, Thermoplastic Coating Finish, color to be selected by the Architect, P.O. Box 10385 Portland, OR 97296, (800) 547-5909 / (503) 224-8700.

C. Bicycle Lockers:
1. "Bike-Shell Bicycle Lockers" by American Bicycle Security Co., P.O. Box 7359 Ventura, CA 93006, (800) 245-3723; (805) 933-3688.
2. "Secura Bike Lockers" by Sunshine U-Lok 37316 Via Colinas, Ste. 102, Westlake Village, CA 91362, (818) 707-0110.

PART 3 – EXECUTION

3.01 INSTALLATION:

A. Pipe Guards: Excavate footing area to dimensions shown. Clean out bottom of excavation. Install concrete in and around pipe sloping concrete at base away from pipe surface. Form concrete wash at top of pipe. Remove rust and mill scale from pipe and prime. Paint two coats yellow paint in exposed areas of site and paint brown where pipe guards are installed in planters.

B. Trash Receptacles: Inspect related Work and install according to conditions and as directed by manufacturer.

C. Bicycle Racks: Secure mounted racks with steel bolts and drilled expansion anchors as directed by manufacturer. Verify final location with site conditions.

END OF SECTION

SECTION 13 34 19 - METAL BUILDING SYSTEMS

PART 1 GENERAL

1.1 SECTION INCLUDES

A. Metal Framing Components

B. Metal Wall Panels and Trim

C. Metal Roof Panels and Trim

D. Metal Building Accessories

1.2 RELATED SECTIONS

A. Section 03 15 00- Placement of anchor bolt, leveling plates and grout.

B. Section 03 30 00- Cast-in-place concrete.

C. Section 08 31 00 - Overhead doors.

D. Section 08 50 00 - Windows.

E. Section 09 90 00 - Painting: Finish painting of primed steel surfaces.

1.3 REFERENCE STANDARDS

A. American Institute of Steel Construction (AISC):
   1. AISC Specification for Structural Steel Buildings.
   2. AISC Serviceability Design Considerations for Low-Rise Buildings

B. American Iron and Steel Institute (AISI):
   1. AISI North American Specification for the Design of Cold-Formed Steel Structural Members

C. American Welding Society (AWS):
   1. AWS D1.1 / D1.1M – Structural Welding Code – Steel.
   2. AWS D1.3 / D1.3M – Structural Welding Code – Sheet Steel

D. Association for Iron & Steel Technology (AISE):
   1. AISE 13 – Specifications for Design and Construction of Mill Buildings.

E. ASTM International (ASTM):
1. ASTM A 36 – Standard Specification for Carbon Structural Steel
2. ASTM A 48 – Specification for Gray Iron Castings
3. ASTM A 123 – Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
4. ASTM A 307 – Specification for Carbon Steel Bolts and Studs, 60 000 psi Tensile Strength
5. ASTM A 325 – Standard Specification for Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength.
6. ASTM A 354 – Standard Specification for Quenched and Tempered Alloy Steel Bolts, Studs, and Other Externally Threaded Fasteners
7. ASTM A 475 – Specification for Zinc-Coated Steel Wire Strand
8. ASTM A 490 – Specification for Structural Bolts, Alloy Steel, Heat Treated, 150 ksi Minimum Tensile Strength
9. ASTM A 500 – Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes
10. ASTM A 529 – Standard Specification for High-Strength Carbon-Manganese Steel of Structural Quality.
11. ASTM A 563 – Specification for Carbon and Alloy Steel Nuts
12. ASTM A 572 – Standard Specification for High-Strength Low-Alloy Columbium-Vanadium Structural Steel.
13. ASTM A 653 / A 653M – Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process
14. ASTM A 792 / A 792M – Standard Specification for Steel Sheet, 55 % Aluminum-Zinc Alloy-Coated by the Hot-Dip Process
15. ASTM A 992 – Standard Specification for Structural Steel Shapes.
16. ASTM A 1011 – Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength.
17. ASTM A 1039 – Specification for Steel, Sheet, Hot Rolled, Carbon, Commercial, Structural, and High-Strength Low-Alloy, Produced by Twin-Roll Casting Process
18. ASTM E 96 / E 96M – Standard Test Methods for Water Vapor Transmission of Materials.
19. ASTM E 108—Spread-of Flame Testing: Class 1A Rating.
20. ASTM E 283 – Standard Test Method for Determining the Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen.
21. ASTM E 331 – Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference.
22. ASTM E 1592 – Test Method for Structural Performance of Sheet Metal Roof and Siding Systems by Uniform Static Air Pressure Difference
23. ASTM E 1646 – Test Method for Water Penetration of Exterior Metal Roof Panel Systems by Uniform Static Air Pressure Difference
24. ASTM E 1680 – Test Method for Rate of Air Leakage Through Exterior Metal Roof Panel Systems
25. ASTM E 2140 – Test Method for Water Penetration of Metal Roof Panel Systems by Static Water Pressure Head
26. ASTM F 436 – Specification for Hardened Steel Washers

27. ASTM F 1145 – Specification for Turnbuckles, Swaged, Welded, Forged
28. ASTM F 1554 – Specification for Anchor Bolts, Steel, 36, 55, and 105-ksi Yield Strength

F. IAS – International Accreditation Service

G. LGSI – Light Gauge Steel Institute

H. Metal Building Manufacturers Association (MBMA):
1. MBMA Metal Building Systems Manual

1.4 DEFINITIONS

A. Metal Building System: A building system that will employ:
- Either continuous or simple-span 'Z' or 'C'-shaped cold-formed purlins or open-web steel joists for support of the roof cladding.
- Simple-span 'Z' or 'C'-shaped cold-formed purlins or open-web steel joists for support of the steel wall cladding.
- Three-plate, built-up rigid space frames and/or cold-formed 'C' or hot-rolled I-shaped post-and-beam framing to support the roof and wall secondary members.
- All systems (cladding, roof and wall secondary, lateral primary framing, and longitudinal bracing) work together to provide resistance to vertical and lateral loading demands.

B. Gable Asymmetrical: A continuous frame building with an off-center ridge, consisting of tapered or straight columns and tapered or straight rafters. The eave height and roof slope may differ on each side of the ridge. The sidewall girts may be continuous (by-passing the columns) or simple span (flush in the column line). The rafters may or may not have interior columns.

C. Single-Slope: A continuous frame building which does not contain a ridge, but consists of one continuous slope from side to side. The building consists of straight or tapered columns and tapered or straight rafters. The sidewall girts may be continuous (by-passing the columns) or simple span (flush in the column line). The rafters may or may not have interior columns.

D. Roof Slope: Pitch expressed as inches of rise for each 12" of horizontal run.

E. Building Width: Measured from outside to outside of sidewall secondary structural member (girt).

F. Building Eave Height: A nominal dimension measured from the finished floor to top flange of eave strut.

G. Building Length: Measured from outside to outside of endwall secondary structural member.

H. Auxiliary Loads: Dynamic loads induced by cranes, conveyors, or other material handling systems.

I. Collateral Loads: The weight of any non-moving equipment or material, such as ceilings, electrical or mechanical equipment, sprinkler systems, plumbing, or ceilings.

J. Dead Load: The actual weight of the building system (as provided by the metal building supplier) supported by a given member.

K. Floor Live Loads: Loads induced on a floor system by occupants of a building and their furniture, equipment, etc.

L. Roof Live Loads: Loads produced by maintenance activities, rain, erection activities, and other movable or moving loads but not including wind, snow, seismic, crane, or dead loads.

M. Roof Snow Loads: Gravity load induced by the weight of snow or ice on the roof, assumed to act on the horizontal projection of the roof.

N. Seismic Loads: Loads acting in any direction on a structural system due to the action of an earthquake.

O. Wind Loads: The loads on a structure induced by the forces of wind blowing from any horizontal direction.

1.5 DESIGN REQUIREMENTS

A. General
1. The building manufacturer will use standards, specifications, recommendations, findings and/or interpretations of professionally-recognized groups such as AISC, AISI, AWS, ASTM, CSA, CWB, MBMA, Federal Specifications, and unpublished research by MBMA as the basis for establishing design, drafting, fabrication, and quality criteria, practices, and tolerances. The Manufacturer's design, drafting, fabrication and quality criteria, practices, and tolerances shall govern, unless specifically countermanded by the contract documents.
2. Design structural mill sections and built-up plate sections in accordance with:
   a. (US) code-appropriate edition of AISC's "Specification for the Design, Fabrication and Erection of Structural Steel for Buildings", ANSI/AISC 360 ASD method.
   b. (Canada) CSA S16, “Design of Steel Structures”, latest edition.
3. Cold-Formed steel structural members and panels will generally be designed in accordance with "Specifications for the Design of Cold-Formed Steel Structural Members", 2007 Edition, ANSI/AISI S-100-07 or CAN CSA S136-07.

4. Design weldments per the following:
   a. Structural Welding
      1) (US) Design per AWS D1.1, “Structural Welding Code – Steel”, Latest Edition.
      2) (Canada) Design per CWB W59, “Welded Steel Construction (Metal Arc Welding)”, Latest Edition.
   b. Cold-Formed Welding
      1) (US) Design per AWS D1.3, “Structural Welding Code – Sheet Steel”, Latest Edition.
      2) (Canada) Design per CWB W59, “Welded Steel Construction (Metal Arc Welding)”, Latest Edition.

B. Design Code:
1. Structural design for the building structural system shall be provided by the metal building system manufacturer for the following design criteria:
   a. Governing Building Code: C.B.C.
   b. Year/Version: 2013
   c. Occupancy Category: IV Essential Facilities

C. Design Loads:
1. Dead Load – Weight of the building system as determined by manufacturer.
2. Roof Live Load – 20 PSF reducible per code.
3. Collateral Load – 5 PSF.
4. Roof Snow Load:
   a. Ground Snow Load – 0 PSF.
5. Wind Load:
   a. Wind Speed – 115 MPH.
   b. Wind Exposure – C.
6. Seismic Load:
   a. Spectral response acceleration for short periods (Ss) – .769.
   b. Spectral response acceleration for 1-sec. period (S1) – .292.
   c. Site Class – D.

D. General Serviceability Limits :
1. Deflection Limits shall be in accordance with the applicable provisions of the Metal Building Systems Manual (MBMA), latest edition.
2. Vertical Deflections:
   a. Roof Secondary (Purlins) – L/150.
   b. Main Frame roof beams – L/180.
3. Horizontal Deflections:
   a. Wall Secondary (Girts) – L/240.
   b. Main Frames – H/60.
4. Vertical deflection limits apply for snow load (50-year mean-recurrence interval) plus collateral load, or the code required live load. The horizontal drift and deflections limits apply for the loads induced by a basic wind speed corresponding to a 10 year mean-recurrence interval.

1.6 SUBMITTALS

A. Submit under provisions of Section 01 33 00.

B. Product Data: Manufacturer's data sheets on each product to be used, including:
1. Preparation instructions and recommendations.
2. Storage and handling requirements and recommendations.
3. Installation methods.

C. Shop Drawings: Provide complete erection drawings for the proper identification and assembly of all building components. Drawings will show anchor bolt settings, transverse cross-sections, sidewall, endwall and roof framing, flashing and sheeting, and accessory installation details.

D. Selection Samples: For each finish product specified, two complete sets of color chips representing manufacturer's full range of available colors and patterns.

E. Verification Samples: For each finish product specified, two samples, representing actual product, color, and patterns.

F. Certifications: Shop drawings and design analysis shall bear the seal of a registered professional engineer upon request. Design analysis shall be on file and furnished by manufacturer upon request.

G. Bill of Materials: Bills of material shall be furnished and shall include item weights.

H. Preventative Maintenance Manual.

I. Welder's Certifications: Certification of welder qualifications shall be furnished as specified by the Project Engineer.

J. Submit certification verifying that the metal standing seam roof system has been tested in accordance with ASTM E 1592 test protocols.

1.7 QUALITY ASSURANCE

A. Manufacturer / Fabricator Qualifications:
   1. All primary products specified in this section will be supplied by a single IAS AC 472 Accredited Manufacturer /Fabricator with a minimum of five (5) years' experience.

B. Weldments/Welder/Weld Inspection Qualifications:
   1. Welding inspection and welding inspector qualification for structural steel shall be in accordance with AWS D1.1, "Structural Welding Code – Steel", latest edition. Welding inspection and welding inspector qualification for cold-formed steel shall be in accordance with AWS D1.3, "Structural Welding Code – Sheet Steel", latest edition.

C. Erector Qualifications: All products listed in this section are to be installed by a single installer with a minimum of five (5) years demonstrated experience in installing products of the same type and scope as specified.

D. Design: Standard drawings and design analysis must bear the seal of a registered professional engineer. Design analysis must be on file and furnished by manufacturer upon request.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Delivery and Acceptance Requirements: Deliver materials to site in manufacturer's original, unopened containers and packaging, with labels clearly identifying product name and manufacturer.

B. Storage and Handling Requirements:
1. Store and handle materials in accordance with manufacturer's instructions.
2. Keep materials in manufacturer's original, unopened containers and packaging until installation.
3. Do not store materials directly on ground.
4. Store materials on flat, level surface, raised above ground, with adequate support to prevent sagging.
5. Protect materials and finish during storage, handling, and installation to prevent damage.

C. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits.

D. Store and dispose of hazardous materials, and materials contaminated by hazardous materials, in accordance with requirements of local authorities having jurisdiction.

1.9 WARRANTY

A. Building System Warranty
1. Furnish manufacturer's standard warranty for the metal building system, excluding paint.
2. The manufacturer shall warranty the metal building system against failure due to defective material or workmanship for a period of one (1) year from date of shipment.
3. The liability under this warranty shall be limited to furnishing, but not dismantling or installing, necessary replacement material F.O.B. manufacturer's plant. In no event shall the manufacturer be liable for loss of profits, or other incidental, consequential, or special damages.

B. Standing Seam Roof Weathertightness Warranty(Optional)
1. Furnish manufacturer's weathertightness warranty for a maximum of 20 years against leaks in standing seam roof panels, arising out of or caused by ordinary wear and tear under normal weather and atmospheric conditions.

C. Roof and Wall Paint Finish Warranty
1. Paint Systems

a. Furnish manufacturer's standard warranty for the metal panel paint system against chipping, peeling, blistering, fading in excess of 5 NBS Hunter units as set forth in ASTM-D-2244, and chalking in excess of 8 units as set forth in ASTM-D-4214.
b. The warranty shall be for a period of 30 years from the date of shipment for PVDF paint systems.
c. Furnish manufacturer's standard warranty for the Galvalume® panels against rupture, structural failure, or perforation due to normal atmospheric conditions.

PART 2 PRODUCTS

2.1 MANUFACTURERS

A. Acceptable Manufacturer: Nucor Building Systems; http://www.nucorbuildingsystems.com

B. Substitutions: Manufacturer that are members or the MBMA with prior approval.

2.2 MATERIALS

A. Primary Framing Steel:
1. Steel for hot rolled shapes must conform to the requirements of ASTM Specifications A-36, A-572 or A-992, with minimum yield of 36 or 50 ksi, respectively.
2. Steel for built-up sections must conform to the requirements of ASTM A-1011, A-1018, A-529, A-572 or A-36 as applicable, with minimum yield of 42, 46, 50, or 55 ksi as indicated by the design requirements.
3. Round Tube must conform to the requirements of ASTM A-500 Grade B with minimum yield strength of 42 ksi.
4. Square and Rectangular Tube must conform to the requirements of ASTM A-500 Grade B with a minimum yield strength of 46 ksi.
5. Steel for Cold-Formed Endwall "C" sections must conform to the requirements of ASTM A-1011 or A-1039 Grade 55, or ASTM A-653 Grade 55 with minimum yield strength of 55 ksi.
6. X-bracing will conform to ASTM A-36 or ASTM A-529 for rod and angle bracing or ASTM A-475 for cable bracing.

B. Secondary Framing Steel:
1. Steel used to form purlins, girts and eave struts must meet the requirements of ASTM A-1011 or ASTM A-1039 Grade 55 for primed material or ASTM A-653 Grade 55 for galvanized material with a minimum yield of 55 ksi.
2. Design Thicknesses – Gauge to be determined by design to meet specified loading conditions.

C. Panels:
1. Roll-formed Galvalume®, pre-painted Galvalume®.

2. Standing Seam Panels must have:
    a. 50 percent minimum aluminum-zinc alloy- coating and conform to ASTM A-792 or ASTM A-653 with a minimum yield of 50 ksi.
3. Through-fastened panels must have:
    a. (For US and Export) 50 percent minimum aluminum-zinc alloy coating and conform to ASTM A-792 or ASTM A-653 with a minimum yield of 50 ksi.
    b. (For Canada) 55 percent minimum aluminum-zinc alloy- coating with Galvalume finish or 50 percent minimum aluminum-zinc alloy- coating with paint finish and conform to ASTM A-792 or ASTM A-653 with a minimum yield of 50 ksi.
4. Panel Finish:
    a. PVDF Finish: 70% PVDF paint system with a 30-year finish warranty.

D. Panel Fasteners:
1. For Galvalume® and Painted finished roof panels: Long Life Cast Zinc head.
2. For wall panels: Coated carbon steel.
3. Color of exposed fastener heads to match the wall and roof panel finish.
4. Concealed Fasteners: Self-drilling type, of size required.

E. Flashing and Trim: Match material, finish, and color of adjacent components. Provide trim at rakes, including peak and corner assemblies, high and low eaves, corners, bases, framed openings and as required or specified to provide weathertightness and a finished appearance.

F. Roof Clips:
1. All clips must have factory-applied mastic and designed so that movement between the panel and the clip does not occur.
2. Short or Tall Fixed clips; shall be either 3 ½ inches (89mm) or 4 ½ inches (114mm) in height. Used for applications where only a moderate amount of thermal expansion and contraction in the roof panel is expected.
3. Short or Tall Sliding clips: shall be either 3 ½ inches (89mm) or 4 ½ inches (114mm) in height and provide either 1-7/8 inches or 3 7/8 inches of travel for panel thermal expansion and contraction, depending on clip choice.

G. Sealant And Closures:
1. Sidelaps: Factory applied non-skinning Butyl mastic.
2. Endlaps, Eave, Ridge Assembly, and Gable Flashings: Field applied 100% solids butyl-based elastomeric tape sealant, furnished in pre-cut lengths.
3. Outside Closures: Closed-cell, plastic or metal
4. Inside Closures: Closed-cell, plastic or metal

2.3 PRIMARY FRAMING

A. Rigid Frames: Fabricated as welded built-up "I" sections or hot-rolled sections.
   1. Frame Design: Gable Unsymmetrical.
   2. Frame Design: Single Slope.
   3. Frame Type: Clear-Span.
   4. Frame Type: Multi-Span.

B. Rigid Frame Columns:
   1. Straight/Uniform depth
   2. Tapered

C. Rigid Frame Rafters:
   1. Straight/Uniform depth
   2. Tapered

D. Endwall Frames / Roof Beams: Rigid Frames: Fabricated as welded built-up "I" sections. Fabricate endwall columns of cold-formed "C" sections, mill-rolled sections, or built-up "I" sections depending on design requirements.

E. Interior Columns: Columns supporting rafters of mainframes shall be of the following cross-section type(s):
   1. Tube (Square HSS).

F. Finish: Red-Oxide or Gray Primer, or galvanized (pre coated galvanized cold-form, hot-dipped otherwise).

G. Field Bolted Connections: All field bolted connections shall be designed and detailed utilizing ASTM A-325 or A-490 depending on design requirement.

2.4 SECONDARY FRAMING

A. Purlins and Girts: Purlins and girts shall be cold-formed "Z" sections with stiffened flanges. Flange stiffeners shall be sized to comply with the requirements of the latest edition of AISI and LGSI. They shall be pre-punched at the factory to provide for field bolting to the rigid frames. They shall be simple or continuous span as required by design. Connection bolts will install through the purlin/girt webs, not purlin/girt flanges.

B. Purlins (Excluding Open Web Joists): Horizontal structural members which support roof coverings.
   1. Depth: 10”
   2. Maximum Length: To be determined by design.
   3. Finish: Red Oxide Primer.

C. Girts: Horizontal structural members that support vertical panels.
   1. Depth: To be determined by design (8”, 10”, or 12”)
   2. Maximum Length: To be determined by design.
   3. Finish: Red Oxide Primer.

D. Eave Struts: Unequal flange, cold-formed "C" sections or “Z” purlins.
   1. Depth: To be determined by design 10”
   2. Maximum Length: To be determined by design.
   3. Finish: Red Oxide Primer.

E. Base Framing: Base members to which the base of the wall covering may be attached to the perimeter of the slab. Secured to the concrete slab with mechanical anchors.
   1. Formed base sill.
   2. Base channel.
      a. With flashing.
      b. Without flashing.
   3. Base angle.
      a. With flashing.
   4. Finish: Pre Coated Galvanized.

2.5 ROOF PANELS

A. Nucor CFR Roof™ Panel: A mechanically seamed trapezoidal standing seam roof panel with concealed clips. Installed directly over purlins. Tested in accordance with ASTM E 1646 and E 1680 for water penetration and air infiltration, and per ASTM E1592 for wind uplift capacity.
   1. Gauge: 24
   2. Dimensions: 24 inches (610mm) wide by 3 inches (76mm) high.
   3. Clips: Tall Fixed.
   4. Clips: Tall Sliding.
   5. Finish/Color: As specified in Article 2.8 PANEL FINISH.

B. AWI "HR3" Insulated Panel: A through-fastened sandwich panel with 1 1/4 inch (32mm) ribs at 12 inches (305mm) on center. The area between the ribs is reinforced to prevent oil-canning. . Tested in accordance with ASTM E 283 and E 331 for water penetration and air infiltration.
   1. Exterior panel gauge: 26.
   2. Interior panel gauge: 26.
   3. Size / Thermal Value: 40 inches (1016mm) wide by 4 inches (102mm) high (R-33).
   4. Color: As specified in Article 2.8 PANEL FINISHES.
   5. Standard Finish:
      a. Exterior: Smooth with Mesa profile.
      b. Interior: Light Emboss with Mesa profile.

2.6 WALL PANELS

A. AWI "HE40" Insulated Panel: A through-fastened wall sandwich panel with concealed fasteners.
   1. Exterior panel gauge: 26 (Std.).
   2. Exterior panel gauge: 24.
   3. Exterior panel gauge: 22.
   4. Interior panel gauge: 26 (Std.).
   5. Interior panel gauge: 24.
   6. Interior panel gauge: 22
   7. Size / Thermal Value: 40 inches (1016mm) wide by 2 inches (51mm) high (R-16).
   8. Size / Thermal Value: 40 inches (1016mm) wide by 2 1/2 inches (64mm) high (R-20).
   9. Size / Thermal Value: 40 inches (1016mm) wide by 3 inches (76mm) high (R-24).
   10. Size / Thermal Value: 40 inches (1016mm) wide by 4 inches (102mm) high (R-32).
   11. Color: As specified in Article 2.8 PANEL FINISHES.
   12. Standard Finish:
      a. Exterior: Heavy Embossed with no profile.
      b. Interior: Light Emboss with Mesa profile.

B. AWI "HE40-A" Insulated Panel: A through-fastened wall sandwich panel with concealed fasteners.
   1. Exterior panel gauge: 26
   2. Interior panel gauge: 26
   3. Size / Thermal Value: 40 inches (1016mm) wide by 4 inches (102mm) high (R-32).
   4. Color: As specified in Article 2.8 PANEL FINISHES.
   5. Standard Finish:
      a. Exterior: Adobe Texture™ with no profile.
      b. Interior: Light Emboss with Mesa profile.

C. AWI "HR3" Insulated Panel: A through-fastened sandwich panel with 1 1/4 inch (32mm) ribs at 12 inches (305mm) on center. The area between the ribs is reinforced to prevent oil-canning. . Tested in accordance with ASTM E 283 and E 331 for water penetration and air infiltration.
   1. Exterior panel gauge: 26.
   2. Interior panel gauge: 26.
   3. Size / Thermal Value: 40 inches (1016mm) wide by 4 inches (102mm) high (R-33).
   4. Color: As specified in Article 2.8 PANEL FINISHES.
   5. Standard Finish:
      a. Exterior: Smooth with Mesa profile.
      b. Interior: Light Emboss with Mesa profile.

D. AWI "DM40" Insulated Panel: A through-fastened wall sandwich panel with concealed fasteners.
   1. Exterior panel gauge: 26
   2. Interior panel gauge: 26
   3. Size / Thermal Value: 40 inches (1016mm) wide by 4 inches (102mm) high (R-32).

4. Color: As specified in Article 2.8 PANEL FINISHES.
5. Standard Finish:
   a. Exterior: Smooth with Mesa profile.
   b. Interior: Light Emboss with Mesa profile.

2.7 ACCESSORIES

A. Canopies: Overhanging or projecting roof structures off the sidewall or endwall with the extreme end usually unsupported. For aesthetic application or to cover entrance or walkway.

B. Roof Line Trim:
   1. Trim Type: Low-Eave Gutter / Sculptured Rake Trim.

C. Purlin Extensions: Overhanging or projecting roof structure at the end of a building.

D. Framed Openings: Used to frame out doors, windows, louvers, and any other openings. Refers to the framing members and flashing which surround an opening and includes jambs, header and or sill, trim, and fasteners.

E. Pipe Flashings: Aluminum base with EPDM boot. The base flange must bend to form a seal with surface irregularities or roof pitch.
   1. Size: ¼” to 4” (6 to 102mm) Pipe
   2. Size: 4” to 7” (102 to 178mm) Pipe
   3. Size: 7” to 13” (178 to 330mm) Pipe

2.8 PANEL FINISHES

A. Roof Panel:
   1. Cool Roof Colors:
      a. Nucor PVDF Panel Paint System (PVDF Resin, 30-year Finish Warranty):
         1) Color: Regal White (RW)

B. Insulated Wall panel:
   1. Exterior panel:
      a. Nucor PVDF Panel Paint System (PVDF Resin, 30-year Finish Warranty):
         Per Exterior finish schedule in drawings.
   2. Interior panel:
      a. Nucor Standard Panel Paint System (Siliconized Polyester Resin, 25-year Finish Warranty):
         1) Imperial White

2.9 FABRICATION

A. General:
   1. Shop-fabricate all framing members for field bolted assembly. The surfaces of the bolted connections must be smooth and free from burrs or distortions.
   2. Shop connections must conform to the manufacturer's standard design practices as defined in this section. Certification of welder qualifications will be furnished when required and specified in advance.
   3. All framing members must carry an identifying mark.

B. Primary Framing:
   1. Plates, Stiffeners and Related Members.: Factory weld base plates splice plates, cap plates, and stiffeners into place on the structural members.
   2. Bolt Holes and Related Machining: Shop fabricate base plates, splices and flanges to include bolt connection holes. Shop fabricated webs to include bracing holes.
   3. Secondary structural connections (purlins and girts) to be ordinary bolted connections, which may include welded clips.
   4. Manufacturer is responsible for all welding inspection in accordance with the manufacturer's IAS Accreditation or CAN/CSA A660 Certification. Special inspection by the buyer or owner may be done in the manufacturer's facility and must be noted on the Contract Documents.
   5. Non-Destructive Testing (NDT) - NDT shall be performed and documented as required by the governing building code for this project.

C. Zee Purlins:
   1. Fabricate purlins from cold-formed "Z" sections with stiffened flanges. Size flange stiffeners to comply with the requirements of the latest edition of AISI. Connection bolts will install through the webs, not the flanges.

D. Girts
   1. Girts must be simple or continuous span as required by design. Connection bolts will install through the webs, not the flanges.

E. Bracing:
   1. Diagonal Bracing:
      a. Wind bracing in the roof and/or walls need not be furnished where it can be shown that the diaphragm strength of the roof and/or wall covering is adequate to resist the applied wind or seismic forces. Diagonal bracing in the roof and sidewalls may be used to resist longitudinal loads (wind, crane, etc.) in the structure if diaphragm action cannot be used.
      b. Diagonal bracing will be furnished to length and equipped with hillside washers and nuts at each end. It may consist of rods threaded each end or galvanized cable with suitable threaded end anchors. If load requirements so dictate, bracing may be of structural angle and/or pipe, bolted in place.

   2. Special Bracing: When diagonal bracing is not permitted in the sidewall, a rigid frame type portal or fixed base column will be used. Shear walls can also be used where adequate to resist the applied wind or seismic forces.

3. Flange Braces: The compression flange of all primary framing must be braced laterally with angles connecting to the bottoms chords of purlins or to the webs of girts so that the flange compressive stress is within allowable limits for any combination of loading.

4. Bridging:
   a. Laterally bridge the top and bottom chords of the open-web bar joists as required by design thereof and specified on the building erection drawings.

F. Standing Seam Panels - General:
1. One side of the panel is configured as female, having factory applied hot-melt mastic inside the female seam. The female side will hook over the male side and when seamed creates a continuous lock, forming a weathertight seam.

2. Panels are factory notched at both ends so that field installation can commence or terminate from either end of the building. Panels cannot start at both ends of the building and work towards each other.

3. Maximum panel length is 55 feet (16,764mm) unless otherwise noted in the Contract Documents.

4. Endlaps:
   a. Endlaps must have a 16 gauge backup plate and have the four endlap joint fasteners installed in four pre-punched holes in the flat.
   b. Apply mastic between the panels and secured with #17-14 x 1 1/4 inch (32mm) self-tapping fasteners through the panels, and backup plate to form a compression joint.
   c. "Through-the-Roof" fasteners may only be used at endlaps and eaves.

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Erector present, for compliance with requirements for installation tolerances and other conditions affecting performance of work.

B. Before erection proceeds, survey elevations and locations of concrete and masonry bearing surfaces and locations of anchor rods, bearing plates and other embedment’s to receive structural framing, with Erector present, for compliance with requirements and metal building system manufacturer’s tolerances.

C. Proceed with erection only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Clean surfaces thoroughly prior to installation.

B. Provide temporary shores, guys, braces, and other supports during erection to keep structural framing secure, plumb, and in alignment against temporary construction loads equal in intensity to design loads. Remove temporary supports when permanent structural framing connections and bracing are in place, unless otherwise indicated.

3.3 INSTALLATION

A. The erection of the building system shall be performed by a qualified erector, in accordance with the appropriate erection drawings, erection guides and /or other documents furnished by manufacturer, using proper tools, equipment and safety practices.
B. Erection practices shall conform to “Common Industry Practices”, Section 6, MBMA (LR)-Building Systems Manual.
C. There shall be no field modifications to primary structural members except as authorized and specified by manufacturer.

3.4 PROTECTION

A. Protect installed products until completion of project.

B. Touch-up, repair or replace damaged products before Substantial Completion.

END OF SECTION

SECTION 210548 - VIBRATION AND SEISMIC CONTROLS FOR FIRE-SUPPRESSION PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Isolation pads.
2. Isolation mounts.
3. Restrained elastomeric isolation mounts.
4. Restraining braces.

1.2 DEFINITIONS

A. IBC: International Building Code.

B. ICC-ES: ICC-Evaluation Service.

C. OSHPD: Office of Statewide Health Planning and Development for the State of California.

1.3 PERFORMANCE REQUIREMENTS

A. Seismic-Restraint Loading:

1. Site Class as Defined in the CBC: D.
2. Assigned Seismic Use Group or Building Category as Defined in the CBC: IV.

    a. Component Importance Factor: 1.5.
    b. Component Response Modification Factor: 5.0, Life Safety Designer to obtain soils report and verify provided information
    c. Component Amplification Factor: 2.5, Life Safety Designer to obtain soils report and verify provided information.

3. Design Spectral Response Acceleration at Short Periods (0.2 Second): 0.58 g, Life Safety Designer to obtain soils report and verify provided information.

4. Design Spectral Response Acceleration at 1-Second Period: 0.34 g, Life Safety Designer to obtain soils report and verify provided information.

1.4 SUBMITTALS

A. Product Data: For each product indicated.

B. Delegated-Design Submittal: For vibration isolation and seismic-restraint calculations and details indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

C. Welding certificates.

D. Qualification Data: For professional engineer.

1.5 QUALITY ASSURANCE

A. Comply with seismic-restraint requirements in the CBC and NFPA 13 unless requirements in this Section are more stringent.

B. Welding: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

C. Seismic-restraint devices shall have horizontal and vertical load testing and analysis and shall bear anchorage preapproval OPA number from OSHPD, preapproval by ICC-ES, or preapproval by another agency acceptable to authorities having jurisdiction, showing maximum seismic-restraint ratings. Ratings based on independent testing are preferred to ratings based on calculations. If preapproved ratings are not available, submittals based on independent testing are preferred. Calculations (including combining shear and tensile loads) to support seismic-restraint designs must be signed and sealed by a qualified professional engineer.

PART 2 - PRODUCTS

2.1 VIBRATION ISOLATORS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

C. Basis-of-Design Product: Subject to compliance with requirements, provide or a comparable product of the following:

1. Ace Mountings Co., Inc.

2. Amber/Booth Company, Inc.
3. California Dynamics Corporation.
4. Isolation Technology, Inc.
5. Kinetics Noise Control.
6. Mason Industries.
7. Vibration Eliminator Co., Inc.
8. Vibration Isolation.
9. Vibration Mountings & Controls, Inc.

D. Pads: Arranged in single or multiple layers of sufficient stiffness for uniform loading over pad area, molded with a nonslip pattern and galvanized-steel baseplates, and factory cut to sizes that match requirements of supported equipment.

1. Resilient Material: Oil- and water-resistant.

E. Mounts: Double-deflection type, with molded, oil-resistant rubber, hermetically sealed compressed fiberglass, or neoprene isolator elements with factory-drilled, encapsulated top plate for bolting to equipment and with baseplate for bolting to structure. Color-code or otherwise identify to indicate capacity range.

1. Materials: Cast-ductile-iron or welded steel housing containing two separate and opposing, oil-resistant rubber or neoprene elements that prevent central threaded element and attachment hardware from contacting the housing during normal operation.
2. Neoprene: Shock-absorbing materials compounded according to the standard for bridge-bearing neoprene as defined by AASHTO.

F. Restrained Mounts: All-directional mountings with seismic restraint.

1. Materials: Cast-ductile-iron or welded steel housing containing two separate and opposing, oil-resistant rubber or neoprene elements that prevent central threaded element and attachment hardware from contacting the housing during normal operation.
2. Neoprene: Shock-absorbing materials compounded according to the standard for bridge-bearing neoprene as defined by AASHTO.

2.2 SEISMIC-RESTRAINT DEVICES

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

C. Basis-of-Design Product: Subject to compliance with requirements, provide or a comparable product of the following:

1. Amber/Booth Company, Inc.
2. California Dynamics Corporation.
3. Cooper B-Line, Inc.; a division of Cooper Industries.
4. Hilti, Inc.
5. Kinetics Noise Control.
6. Loos & Co.; Cableware Division.
7. Mason Industries.
8. TOLCO Incorporated; a brand of NIBCO INC.
9. Unistrut; Tyco International, Ltd.

D. General Requirements for Restraint Components: Rated strengths, features, and applications shall be as defined in reports by an agency acceptable to authorities having jurisdiction.

1. Structural Safety Factor: Allowable strength in tension, shear, and pullout force of components shall be at least four times the maximum seismic forces to which they will be subjected.

E. Channel Support System: MFMA-3, shop- or field-fabricated support assembly made of slotted steel channels with accessories for attachment to braced component at one end and to building structure at the other end and other matching components and with corrosion-resistant coating; and rated in tension, compression, and torsion forces.

F. Hanger Rod Stiffener: Steel tube or steel slotted-support-system sleeve with internally bolted connections to hanger rod.

G. Bushings for Floor-Mounted Equipment Anchor Bolts: Neoprene bushings designed for rigid equipment mountings, and matched to type and size of anchor bolts and studs.

H. Resilient Isolation Washers and Bushings: One-piece, molded, oil- and water-resistant neoprene, with a flat washer face.

I. Mechanical Anchor Bolts: Drilled-in and stud-wedge or female-wedge type in zinc-coated steel for interior applications and stainless steel for exterior applications. Select anchor bolts with strength required for anchor and as tested according to ASTM E 488. Minimum length of eight times diameter.

PART 3 - EXECUTION

3.1 VIBRATION-CONTROL AND SEISMIC-RESTRAINT DEVICE INSTALLATION

A. Equipment Restraints:

1. Install resilient bolt isolation washers on equipment anchor bolts where clearance between anchor and adjacent surface exceeds 0.125 inch.
2. Install seismic-restraint devices using methods approved by an agency acceptable to authorities having jurisdiction providing required submittals for component.

B. Piping Restraints:

1. Comply with requirements in MSS SP-127 and NFPA 13.
2. Space lateral supports a maximum of 40 feet o.c., and longitudinal supports a maximum of 80 feet o.c. or as required by agency having jurisdiction whichever is more stringent.
3. Brace a change of direction longer than 12 feet, or as required by agency having jurisdiction whichever is more stringent.

C. Install seismic-restraint devices using methods approved by an agency acceptable to authorities having jurisdiction providing required submittals for component.

D. Install bushing assemblies for anchor bolts for floor-mounted equipment, arranged to provide resilient media between anchor bolt and mounting hole in concrete base.

E. Attachment to Structure: If specific attachment is not indicated, anchor bracing to structure at flanges of beams, at upper truss chords of bar joists, or at concrete members.

F. Drilled-in Anchors:

1. Identify position of reinforcing steel and other embedded items prior to drilling holes for anchors. Do not damage existing reinforcing or embedded items during coring or drilling. Notify the structural engineer if reinforcing steel or other embedded items are encountered during drilling. Locate and avoid prestressed tendons, electrical and telecommunications conduit, and gas lines.
2. Do not drill holes in concrete or masonry until concrete, mortar, or grout has achieved full design strength.
3. Wedge Anchors: Protect threads from damage during anchor installation. Heavy-duty sleeve anchors shall be installed with sleeve fully engaged in the structural element to which anchor is to be fastened.
4. Set anchors to manufacturer's recommended torque, using a torque wrench.
5. Install zinc-coated steel anchors for interior and stainless-steel anchors for exterior applications.

3.2 ACCOMMODATION OF DIFFERENTIAL SEISMIC MOTION

A. Install flexible connections in piping where they cross seismic joints, where adjacent sections or branches are supported by different structural elements, and where the connections terminate with connection to equipment that is anchored to a different structural element from the one supporting the connections as they approach equipment. Comply with requirements in Division 21.

END OF SECTION 210548

SECTION 211100 - FACILITY FIRE-SUPPRESSION WATER-SERVICE PIPING

PART 1 - GENERAL

1.1 SUMMARY

A. Section includes fire-suppression water-service piping and related components outside the building and service entrance piping through floor into the building.

B. Utility-furnished products include water meters that will be furnished to the site, ready for installation.

C. Related Sections:

1. Division 21 Section "Fire-Suppression Standpipes" for fire-suppression standpipes inside the building.
2. Division 21 Section "Wet-Pipe Sprinkler Systems" for wet-pipe fire-suppression sprinkler systems inside the building.

1.2 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings:

1. Detail precast concrete vault assemblies and indicate dimensions, method of field assembly, and components.
2. Wiring Diagrams: For power, signal, and control wiring.

C. Field quality-control reports.

1.3 QUALITY ASSURANCE

A. Regulatory Requirements:

1. Comply with requirements of utility company supplying water. Include tapping of water mains and backflow prevention.
2. Comply with standards of authorities having jurisdiction for fire-suppression water-service piping, including materials, hose threads, installation, and testing.

B. Piping materials shall bear label, stamp, or other markings of specified testing agency.

C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

D. Comply with the "Approval Guide," published by FM Global, or UL's "Fire Protection Equipment Directory" for fire-service-main products.

E. NFPA Compliance: Comply with NFPA 24 for materials, installations, tests, flushing, and valve and hydrant supervision for fire-suppression water-service piping.

F. Submit three (3) copies of approval letter following system test from the NFPA.

1.4 COORDINATION

A. Coordinate connection to water main with utility company.

1.5 PROJECT CONDITIONS:

A. Obtain and pay for all plan check fees, permits, test, inspections, etc., including those required for the installation of service piping, meter, vaults, etc., as required by the serving utility and rating agency.

B. Sprinkler contractor shall be licensed with the state and local authorities as required.

C. Completely test the system in conformity with the requirements of NFPA and any other requirements.

1.6 SPECIAL PROJECT GUARANTEE: All workmanship and materials shall be guaranteed free from defect for a period of two years from the date of final acceptance

PART 2 - PRODUCTS

2.1 COPPER TUBE AND FITTINGS

A. Hard Copper Tube: ASTM B 88, Type K and ASTM B 88, Type L, water tube, drawn temper.

B. Copper, Solder-Joint Fittings: ASME B16.18, cast-copper-alloy or ASME B16.22, wrought-copper, solder-joint pressure type. Furnish only wrought-copper fittings if indicated.

C. Bronze Flanges: ASME B16.24, Class 150, with solder-joint end. Furnish Class 300 flanges if required to match piping.

D. Copper Unions: MSS SP-123, cast-copper-alloy, hexagonal-stock body with ball-and-socket, metal-to-metal seating surfaces, and solder-joint or threaded ends.

2.2 DUCTILE-IRON PIPE AND FITTINGS

A. Grooved-Joint, Ductile-Iron Pipe: AWWA C151, with cut, rounded-grooved ends.

B. Mechanical-Joint, Ductile-Iron Pipe: AWWA C151, with mechanical-joint bell and plain spigot end.

C. Push-on-Joint, Ductile-Iron Pipe: AWWA C151, with push-on-joint bell and plain spigot end.

D. Grooved-End, Ductile-Iron Pipe Appurtenances:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

    a. Anvil International, Inc.
    b. Shurjoint Piping Products.
    c. Star Pipe Products.
    d. Victaulic Company.

2. Grooved-End, Ductile-Iron Fittings: ASTM A 47/A 47M, malleable-iron castings or ASTM A 536, ductile-iron castings with dimensions matching pipe.
3. Grooved-End, Ductile-Iron-Piping Couplings: AWWA C606, for ductile-iron-pipe dimensions. Include ferrous housing sections, gasket suitable for water, and bolts and nuts.

E. Mechanical-Joint, Ductile-Iron Fittings: AWWA C110, ductile- or gray-iron standard pattern or AWWA C153, ductile-iron compact pattern.

1. Glands, Gaskets, and Bolts: AWWA C111, ductile- or gray-iron glands, rubber gaskets, and steel bolts.

F. Push-on-Joint, Ductile-Iron Fittings: AWWA C153, ductile-iron compact pattern.

1. Gaskets: AWWA C111, rubber.

G. Flanges: ASME B16.1, Class 125, cast iron.

2.3 SPECIAL PIPE FITTINGS

A. Ductile-Iron Flexible Expansion Joints:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

    a. EBAA Iron, Inc.
    b. ROMAC Industries Inc.
    c. Star Pipe Products.

2. Description: Compound, ductile-iron fitting with combination of flanged and mechanical-joint ends complying with AWWA C110 or AWWA C153. Include two gasketed ball-joint sections and one or more gasketed sleeve sections. Assemble components for offset and expansion indicated. Include AWWA C111, ductile-iron glands, rubber gaskets, and steel bolts.
3. Pressure Rating: 250 psig minimum.

2.4 ENCASEMENT FOR PIPING

A. Standard: ASTM A 674 or AWWA C105.

B. Material: High-density, cross-laminated PE film of 0.004-inch minimum thickness.

C. Form: Sheet or tube.

D. Color: Black.

2.5 JOINING MATERIALS

A. Gaskets for Ferrous Piping and Copper-Alloy Tubing: ASME B16.21, asbestos free.

B. Brazing Filler Metals: AWS A5.8/A5.8M, BCuP Series.

2.6 PIPING SPECIALTIES

A. Transition Fittings: Manufactured fitting or coupling same size as, with pressure rating at least equal to and ends compatible with, piping to be joined.

B. Tubular-Sleeve Pipe Couplings:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

    a. Cascade Waterworks Manufacturing.
    b. Dresser, Inc.; Dresser Piping Specialties.
    c. Ford Meter Box Company, Inc. (The); Pipe Products Division.

d. JCM Industries.
e. ROMAC Industries Inc.
f. Smith-Blair, Inc.; a Sensus company.
g. Viking Johnson.

2. Description: Metal, bolted, sleeve-type, reducing or transition coupling, with center sleeve, gaskets, end rings, and bolt fasteners, and with ends of same sizes as piping to be joined.
3. Standard: AWWA C219.
4. Center-Sleeve Material: Manufacturer's standard.
5. Gasket Material: Natural or synthetic rubber.
6. Pressure Rating: 200 psig minimum.
7. Metal Component Finish: Corrosion-resistant coating or material.

2.7 CORPORATION VALVES AND CURB VALVES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Amcast Industrial Corporation.
2. Ford Meter Box Company, Inc. (The); Pipe Products Division.
3. Jones, James Company.
4. Master Meter, Inc.
5. McDonald, A. Y. Mfg. Co.
6. Mueller Co.; Water Products Division.
7. Red Hed Manufacturing & Supply.

B. Corporation Valves: Comply with AWWA C800. Include saddle and valve compatible with tapping machine and manifold.

1. Service Saddle: Copper alloy with seal and AWWA C800, threaded outlet for corporation valve.
2. Corporation Valve: Bronze body and ground-key plug, with AWWA C800, threaded inlet and outlet matching service piping material.
3. Manifold: Copper fitting with two to four inlets as required, with ends matching corporation valves and outlet matching service piping material.

C. Curb Valves: Comply with AWWA C800 for high-pressure service-line valves. Valve has bronze body, ground-key plug or ball, wide tee head, and inlet and outlet matching service piping material.

D. Service Boxes for Curb Valves: Similar to AWWA M44 requirements for cast-iron valve boxes. Include cast-iron telescoping top section of length required for depth of burial of valve, plug with lettering "WATER," and bottom section with base that fits over curb valve and with a barrel approximately 3 inches in diameter.

1. Shutoff Rods: Steel; with tee-handle with one pointed end, stem of length to operate deepest buried valve, and slotted end matching curb valve.

E. Meter Valves: Comply with AWWA C800 for high-pressure service-line valves. Include angle- or straight-through-pattern bronze body, ground-key plug or ball, and wide tee head, with inlet and outlet matching service piping material.

2.8 GATE VALVES

A. AWWA Gate Valves:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. American AVK Company; Valves & Fittings Division.
b. American Cast Iron Pipe Company; American Flow Control Division.
c. American Cast Iron Pipe Company; Waterous Company Subsidiary.
d. American R/D.
e. Clow Valve Company; a division of McWane, Inc.
f. Crane Co.; Crane Valve Group; Stockham Division.
g. East Jordan Iron Works, Inc.
h. Kennedy Valve; a division of McWane, Inc.
i. M&H Valve Company; a division of McWane, Inc.
j. Mueller Co.; Water Products Division.
k. NIBCO INC.
l. Tyler Pipe; a division of McWane, Inc.; Utilities Division.
m. U.S. Pipe.

2. 200-psig, AWWA, Iron, Non-rising-Stem, Metal-Seated Gate Valves:

a. Description: Gray- or ductile-iron body and bonnet; with cast-iron or bronze double-disc gate, bronze gate rings, bronze stem, and stem nut.
b. Standard: AWWA C500.
c. Pressure Rating: 200 psig.
d. End Connections: Mechanical joint.
e. Interior Coating: Complying with AWWA C550.

3. 200-psig, AWWA, Iron, Non-rising-Stem, Resilient-Seated Gate Valves:

a. Description: Gray- or ductile-iron body and bonnet; with bronze or gray- or ductile-iron gate, resilient seats, bronze stem, and stem nut.
b. Standard: AWWA C509.
c. Pressure Rating: 200 psig.
d. End Connections: Mechanical or push-on joint.
e. Interior Coating: Complying with AWWA C550.

4. 200-psig, AWWA, Iron, OS&Y, Metal-Seated Gate Valves:

    a. Description: Cast- or ductile-iron body and bonnet; with cast-iron double disc, bronze disc and seat rings, and bronze stem.
    b. Standard: AWWA C500.
    c. Pressure Rating: 200 psig.
    d. End Connections: Flanged or grooved.

5. 200-psig, AWWA, Iron, OS&Y, Resilient-Seated Gate Valves:

    a. Description: Cast- or ductile-iron body and bonnet; with bronze, gray-iron, or ductile-iron gate; resilient seats; and bronze stem.
    b. Standard: AWWA C509.
    c. Pressure Rating: 200 psig.
    d. End Connections: Flanged or grooved.

6. Class 125, Bronze, Non-rising-Stem Gate Valves:

    a. Description: Class 125, Type 1; bronze with solid wedge and malleable-iron handwheel.
    b. Standard: MSS SP-80.
    c. Pressure Rating: 200 psig.
    d. End Connections: Solder joint or threaded.

B. UL-Listed or FM-Approved Gate Valves:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

    a. American AVK Company; Valve & Fittings Division.
    b. American Cast Iron Pipe Company; American Flow Control Division.
    c. American Cast Iron Pipe Company; Waterous Company Subsidiary.
    d. Clow Valve Company; a division of McWane, Inc.
    e. Crane Co.; Crane Valve Group; Jenkins Valves.
    f. Crane Co.; Crane Valve Group; Stockham Division.
    g. East Jordan Iron Works, Inc.
    h. Hammond Valve.
    i. Kennedy Valve; a division of McWane, Inc.
    j. M&H Valve Company; a division of McWane, Inc.
    k. Milwaukee Valve Company.
    l. Mueller Co.; Water Products Division.
    m. NIBCO INC.
    n. Shurjoint Piping Products.
    o. Troy Valve; a division of Penn-Troy Manufacturing, Inc.
    p. Tyco Fire & Building Products LP.

q. United Brass Works, Inc.
r. U.S. Pipe.
s. Watts Water Technologies, Inc.

2. 175-psig, UL-Listed or FM-Approved, Iron, Non-rising-Stem Gate Valves:

a. Description: Iron body and bonnet, bronze seating material, and inside screw.
b. Standards: UL 262 and "Approval Guide," published by FM Global, listing.
c. Pressure Rating: 175 psig minimum.
d. End Connections: Mechanical or push-on joint.
e. Indicator-Post Flange: Include on valves used with indicator posts.

3. 175-psig, UL-Listed or FM-Approved, Iron, OS&Y, Gate Valves:

a. Description: Iron body and bonnet and bronze seating material.
b. Standards: UL 262 and "Approval Guide," published by FM Global, listing.
c. Pressure Rating: 175 psig minimum.
d. End Connections: Flanged or grooved.

4. UL-Listed or FM-Approved, OS&Y Bronze, Gate Valves:

a. Manufacturers: Subject to compliance with requirements, provide products by one of the following available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1) Crane Co.; Crane Valve Group; Crane Valves.
2) Crane Co.; Crane Valve Group; Stockham Division.
3) Milwaukee Valve Company.
4) NIBCO INC.
5) United Brass Works, Inc.

b. Description: Bronze body and bonnet and bronze stem.
c. Standards: UL 262 and "Approval Guide," published by FM Global, listing.
d. Pressure Rating: 175 psig minimum.
e. End Connections: Threaded.

2.9 GATE VALVE ACCESSORIES AND SPECIALTIES

A. Tapping-Sleeve Assemblies:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
2. Basis-of-Design Product: Subject to compliance with requirements, provide product by one of the following or comparable products:

a. American Cast Iron Pipe Company; Waterous Company Subsidiary.
b. Clow Valve Company; a division of McWane, Inc.
c. East Jordan Iron Works, Inc.
d. Flowserve.
e. Kennedy Valve; a division of McWane, Inc.
f. M&H Valve Company; a division of McWane, Inc.
g. Mueller Co.; Water Products Division.
h. U.S. Pipe.

3. Description: Sleeve and valve compatible with drilling machine.
4. Standard: MSS SP-60.
5. Tapping Sleeve: Cast-iron, ductile-iron, or stainless-steel, two-piece bolted sleeve with flanged outlet for new branch connection. Sleeve shall match size and type of pipe material being tapped and have recessed flange for branch valve.
6. Valve: AWWA, cast-iron, non-rising-stem, metal -seated gate valve with one raised-face flange mating tapping-sleeve flange.

B. Valve Boxes: Comply with AWWA M44 for cast-iron valve boxes. Include top section, adjustable extension of length required for depth of burial of valve, plug with lettering "WATER," and bottom section with base that fits over valve and with a barrel approximately 5 inches in diameter.

1. Operating Wrenches: Steel; with tee-handle with one pointed end, stem of length to operate deepest buried valve, and socket matching valve operating nut.

C. Indicator Posts:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. American AVK Company; Valves & Fittings Division.
b. American Cast Iron Pipe Company; American Flow Control Division.
c. American Cast Iron Pipe Company; Waterous Company Subsidiary.
d. Clow Valve Company; a division of McWane, Inc.
e. Crane Co.; Crane Valve Group; Stockham Division.
f. Kennedy Valve; a division of McWane, Inc.
g. Mueller Co.; Water Products Division.
h. NIBCO INC.
i. Tyco Fire & Building Products LP.

2. Description: Vertical-type, cast-iron body with operating wrench, extension rod, and adjustable cast-iron barrel of length required for depth of burial of valve.
3. Standards: UL 789 and "Approval Guide," published by FM Global, listing.

2.10 WATER METERS

A. Water meters will be furnished by utility company.

B. Manufacturers: Subject to compliance with requirements, provide products by one of the following available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. AMCO Water Metering Systems.
2. Badger Meter, Inc.
3. Carlon Meter.
4. Hays Fluid Controls.
5. McCrometer.
6. Mueller Co.; Hersey Meters Division.
7. Neptune Technology Group Inc.
8. Sensus Metering Systems.

C. Displacement-Type Water Meters:

1. Description: With bronze main case.
2. Standard: AWWA C700.

D. Compound-Type Water Meters:

1. Standard: AWWA C702.

E. Remote Registration System:

1. Description: Utility company's standard; direct-reading type. Include meter modified with signal-transmitting assembly, low-voltage connecting wiring, and remote register assembly.
2. Standard: AWWA C706.

F. Remote Registration System:

1. Description: Utility company's standard; encoder type. Include meter modified with signal-transmitting assembly, low-voltage connecting wiring, and remote register assembly.
2. Standard: AWWA C707.
3. Data-Acquisition Units: Comply with utility company's requirements for type and quantity.
4. Visible Display Units: Comply with utility company's requirements for type and quantity.

2.11 WATER METER BOXES

A. Description: Cast-iron body and cover for disc-type water meter, with lettering "WATER METER" on cover; and with slotted, open-bottom base section of length to fit over service piping.

1. Option: Base section may be cast-iron, PVC, clay, or other pipe.

2.12 CONCRETE VAULTS

A. Description: Precast, reinforced-concrete vault, designed for A-16 load designation according to ASTM C 857, and made according to ASTM C 858.

B. Ladder: ASTM A 36/A 36M, steel ladder; or PE-encased steel steps.

C. Manhole: ASTM A 48/A 48M, Class No. 35A minimum tensile strength, gray-iron traffic frame and cover.

1. Dimension: 24-inch minimum diameter unless otherwise indicated.

D. Manhole: ASTM A 536, Grade 60-40-18, ductile-iron traffic frame and cover.

1. Dimension: 24-inch minimum diameter unless otherwise indicated.

E. Drain: ASME A112.6.3, cast-iron floor drain with outlet of size indicated. Include body anchor flange, light-duty cast-iron grate, bottom outlet, and integral or field-installed bronze ball or clapper-type backwater valve.

2.13 FIRE HYDRANTS

A. AWWA Dry-Barrel Fire Hydrants:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
2. Basis-of-Design Product: Subject to compliance with requirements, provide product by one of the following or comparable equal:

a. American AVK Company; Valves & Fittings Division.
b. American Cast Iron Pipe Company; American Flow Control Division.
c. American Cast Iron Pipe Company; Waterous Company Subsidiary.
d. American Foundry Group, Inc.
e. Clow Valve Company; a division of McWane, Inc.
f. East Jordan Iron Works, Inc.
g. Kennedy Valve; a division of McWane, Inc.

h. M&H Valve Company; a division of McWane, Inc.
i. Mueller Co.; Water Products Division.
j. Troy Valve; a division of Penn-Troy Manufacturing, Inc.
k. U.S. Pipe.

3. Description: Post type, with one NPS 4-1/2 and two NPS 2-1/2 outlets; and with 5-1/4-inch main valve, drain valve, and NPS 6 mechanical-joint inlet. Include interior coating according to AWWA C550. Hydrant shall have cast-iron body and compression-type valve opening against pressure and closing with pressure.
4. Standard: AWWA C502.
5. Pressure Rating: 200 psig minimum.

B. UL-Listed, Dry-Barrel Fire Hydrants:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
2. Basis-of-Design Product: Subject to compliance with requirements, provide product by one of the following or comparable equal:

a. American Cast Iron Pipe Company; American Flow Control Division.
b. American Cast Iron Pipe Company; Waterous Company Subsidiary.
c. American Foundry Group, Inc.
d. Clow Valve Company; a division of McWane, Inc.
e. East Jordan Iron Works, Inc.
f. Kennedy Valve; a division of McWane, Inc.
g. M&H Valve Company; a division of McWane, Inc.
h. Mueller Co.; Water Products Division.
i. Troy Valve; a division of Penn-Troy Manufacturing, Inc.
j. U.S. Pipe.

3. Description: Freestanding, with one NPS 4-1/2 and two NPS 2-1/2 outlets; and with 5-1/4-inch main valve, drain valve, and NPS 6 mechanical-joint inlet. Hydrant shall have cast-iron body and compression-type valve opening against pressure and closing with pressure.
4. Standards: UL 246 and "Approval Guide," published by FM Global, listing.
5. Design: Base valve.
6. Pressure Rating: 200 psig minimum.
7. Outlet Threads: NFPA 1963, with external hose thread used by local fire department. Include cast-iron caps with steel chains.
8. Operating and Cap Nuts: Pentagon, 1-1/2 inches point to flat.
9. Direction of Opening: Hydrant valve opens by turning operating nut to left or counterclockwise.
10. Exterior Finish: Red alkyd-gloss enamel paint unless otherwise indicated.

C. AWWA Wet-Barrel Fire Hydrants:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
2. Basis-of-Design Product: Subject to compliance with requirements, provide product by one of the following or comparable equal:

    a. American AVK Company; Valves & Fittings Division.
    b. Clow Valve Company; a division of McWane, Inc.
    c. Jones, James Company.
    d. Mueller Co.; Water Products Division.

3. Description: Post type, with one NPS 4-1/2 and two NPS 2-1/2 outlets and with NPS 6 threaded or flanged inlet, and base section with NPS 6 mechanical-joint inlet. Include interior coating according to AWWA C550.
4. Standard: AWWA C503.
5. Pressure Rating: 200 psig minimum.

D. UL-Listed, Wet-Barrel Fire Hydrants:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
2. Basis-of-Design Product: Subject to compliance with requirements, provide product by one of the following or comparable equal:

    a. American AVK Company; Valves & Fittings Division.
    b. Clow Valve Company; a division of McWane, Inc.
    c. Jones, James Company.
    d. Mueller Co.; Water Products Division.

3. Description: Freestanding, with one NPS 4-1/2 and two NPS 2-1/2 outlets and with NPS 6 threaded or flanged inlet, and base section with NPS 6 mechanical-joint inlet.
4. Standards: UL 246 and "Approval Guide," published by FM Global, listing.
5. Design: Wet barrel.
6. Pressure Rating: 200 psig.
7. Outlet Threads: NFPA 1963, with external hose thread used by local fire department. Include cast-iron caps with steel chains.
8. Operating and Cap Nuts: Pentagon, 1-1/2 inches point to flat.
9. Direction of Opening: Hydrant valves open by turning operating nut to left or counterclockwise.
10. Exterior Finish: Red alkyd-gloss enamel paint unless otherwise indicated.

2.14 FIRE-DEPARTMENT CONNECTIONS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

B. Basis-of-Design Product: Subject to compliance with requirements, provide product by one of the following or comparable equal:

1. Elkhart Brass Mfg. Company, Inc.
2. Fire-End & Croker Corporation.
3. Guardian Fire Equipment, Inc.
4. Kidde Fire Fighting.
5. Potter Roemer.
6. Reliable Automatic Sprinkler Co., Inc.

C. Description: Freestanding, with cast-bronze body, thread inlets according to NFPA 1963 and matching local fire-department hose threads, and threaded bottom outlet. Include lugged caps, gaskets, and chains; lugged swivel connection and drop clapper for each hose-connection inlet; 18-inch high brass sleeve; and round escutcheon plate.

D. Standard: UL 405.

E. Connections: Three NPS 2-1/2 inlets and one NPS 6 outlet.

F. Inlet Alignment: Inline or horizontal.

G. Finish Including Sleeve: Polished bronze.

H. Escutcheon Plate Marking: "AUTO SPKR & STANDPIPE."

2.15 ALARM DEVICES

A. General: UL 753 and "Approval Guide," published by FM Global, listing, of types and sizes to mate and match piping and equipment.

B. Water-Flow Indicators: Vane-type water-flow detector, rated for 250-psig working pressure; designed for horizontal or vertical installation; with two single-pole, double-throw circuit switches to provide isolated alarm and auxiliary contacts, 7 A, 125-V ac and 0.25 A, 24-V dc; complete with factory-set, field-adjustable retard element to prevent false signals and tamperproof cover that sends signal when cover is removed.

C. Supervisory Switches: Single pole, double throw; designed to signal valve in other than fully open position.

D. Pressure Switches: Single pole, double throw; designed to signal increase in pressure.

PART 3 - EXECUTION

3.1 EARTHWORK

A. Comply with excavating, trenching, and backfilling requirements in Division 31 Section "Earth Moving."

3.2 PIPING INSTALLATION

A. Water-Main Connection: Arrange with water utility company for tap of size and in location indicated in water main.

B. Water-Main Connection: Tap water main according to requirements of water utility company and of size and in location indicated.

C. Make connections larger than NPS 2 with tapping machine according to the following:

1. Install tapping sleeve and tapping valve according to MSS SP-60.
2. Install tapping sleeve on pipe to be tapped. Position flanged outlet for gate valve.
3. Use tapping machine compatible with valve and tapping sleeve; cut hole in main. Remove tapping machine and connect water-service piping.
4. Install gate valve onto tapping sleeve. Comply with MSS SP-60. Install valve with stem pointing up and with valve box.

D. Make connections NPS 2 and smaller with drilling machine according to the following:

1. Install service-saddle assemblies and corporation valves in size, quantity, and arrangement required by utility company's standards.
2. Install service-saddle assemblies on water-service pipe to be tapped. Position outlets for corporation valves.
3. Use drilling machine compatible with service-saddle assemblies and corporation valves. Drill hole in main. Remove drilling machine and connect water-service piping.
4. Install corporation valves into service-saddle assemblies.
5. Install manifold for multiple taps in water main.
6. Install curb valve in water-service piping with head pointing up and with service box.

E. Comply with NFPA 24 for fire-service-main piping materials and installation.

F. Install copper tube and fittings according to CDA's "Copper Tube Handbook."

1. Install encasement for tubing according to ASTM A 674 or AWWA C105.

G. Install ductile-iron, water-service piping according to AWWA C600 and AWWA M41.

1. Install encasement for piping according to ASTM A 674 or AWWA C105.

H. Bury piping with depth of cover over top at least 30 inches, with top at least 12 inches below level of maximum frost penetration.

I. Extend fire-suppression water-service piping and connect to water-supply source and building fire-suppression water-service piping systems at locations and pipe sizes indicated.

1. Terminate fire-suppression water-service piping at building floor slab until building-water-piping systems are installed. Terminate piping with caps, plugs, or flanges as required for piping material. Make connections to building's fire-suppression water-service piping systems when those systems are installed.

J. Install underground piping with restrained joints at horizontal and vertical changes in direction. Use restrained-joint piping, thrust blocks, anchors, tie-rods and clamps, and other supports.

K. Comply with requirements in Division 21 Sections for fire-suppression-water piping inside the building.

L. Comply with requirements for potable-water piping inside the building.

M. Install sleeves for piping penetrations of walls, ceilings, and floors.

N. Install sleeve seals for piping penetrations of concrete walls and slabs.

3.3 JOINT CONSTRUCTION

A. Install couplings, flanges, flanged fittings, unions, nipples, and transition and special fittings that have finish and pressure rating same as or higher than systems pressure rating for aboveground applications unless otherwise indicated.

B. Install unions adjacent to each valve in tubing NPS 2 and smaller.

C. Install flanges, flange adaptors, or couplings for grooved-end piping on valves, apparatus, and equipment having NPS 2-1/2 and larger end connections.

D. Ream ends of tubes and remove burrs.

E. Remove scale, slag, dirt, and debris from outside and inside of pipes, tubes, and fittings before assembly.

F. Copper-Tubing, Brazed Joints: Join copper tube and fittings according to CDA's "Copper Tube Handbook," "Brazed Joints" Chapter.

G. Ductile-Iron Piping, Gasketed Joints for Fire-Service-Main Piping: UL 194.

H. Ductile-Iron Piping, Grooved Joints: Cut-groove pipe. Assemble joints with grooved-end, ductile-iron-piping couplings, gaskets, lubricant, and bolts.

I. Flanged Joints: Select appropriate gasket material in size, type, and thickness suitable for water service. Join flanges with bolts according to ASME B31.9.

J. Dissimilar Materials Piping Joints: Use adapters compatible with both piping materials, with OD, and with system working pressure.

3.4 ANCHORAGE INSTALLATION

A. Anchorage, General: Install water-distribution piping with restrained joints.

B. Install anchorages for tees, plugs and caps, bends, crosses, valves, and hydrant branches in fire-suppression water-service piping according to NFPA 24 and the following:

1. Gasketed-Joint, Ductile-Iron, Water-Service Piping: According to AWWA C600.

C. Apply full coat of asphalt or other acceptable corrosion-resistant material to surfaces of installed ferrous anchorage devices.

3.5 VALVE INSTALLATION

A. AWWA Gate Valves: Comply with AWWA C600 and AWWA M44. Install each underground valve with stem pointing up and with valve box.

B. UL-Listed or FM-Approved Gate Valves: Comply with NFPA 24. Install each underground valve and valves in vaults with stem pointing up and with vertical cast-iron indicator post.

C. MSS Valves: Install as component of connected piping system.

D. Corporation Valves and Curb Valves: Install each underground curb valve with head pointed up and with service box.

E. Support valves and piping, not direct buried, on concrete piers. Comply with requirements for concrete piers in Division 03 Section "Cast-in-Place Concrete."

3.6 WATER METER INSTALLATION

A. Install water meters, piping, and specialties according to utility company's written instructions.

B. Water Meters: Install displacement-type water meters NPS 2 and smaller in meter boxes with shutoff valves on water meter inlets. Include valves on water meter outlets, and include valved bypass around meters unless prohibited by authorities having jurisdiction.

C. Water Meters: Install compound-type water meters NPS 3 and larger in meter vaults. Include shutoff valves on water meter inlets and outlets, and include valved bypass around meters. Support meters, valves, and piping on brick or concrete piers.

D. Support water meters and piping NPS 3 and larger on concrete piers. Comply with requirements for concrete piers in Division 03 Section "Cast-in-Place Concrete."

3.7 ROUGHING-IN FOR WATER METERS

A. Rough-in piping and specialties for water meter installation according to utility company's written instructions.

3.8 WATER METER BOX INSTALLATION

A. Install water meter boxes in paved areas flush with surface.

B. Install water meter boxes in grass or earth areas with top 2 inches above surface.

3.9 CONCRETE VAULT INSTALLATION

A. Install precast concrete vaults according to ASTM C 891.

3.10 FIRE HYDRANT INSTALLATION

A. General: Install each fire hydrant with separate gate valve in supply pipe, anchor with restrained joints or thrust blocks, and support in upright position.

B. Wet-Barrel Fire Hydrants: Install with valve below frost line. Provide for drainage.

C. AWWA Fire Hydrants: Comply with AWWA M17.

D. UL-Listed or FM-Approved Fire Hydrants: Comply with NFPA 24.

3.11 FIRE-DEPARTMENT CONNECTION INSTALLATION

A. Install ball drip valves at each check valve for fire-department connection to mains.

B. Install protective pipe bollards at each fire-department connection. Pipe bollards are specified in Division 05 Section "Metal Fabrications."

3.12 ALARM DEVICE INSTALLATION

A. General: Comply with NFPA 24 for devices and methods of valve supervision. Underground valves with valve box do not require supervision.

B. Supervisory Switches: Supervise valves in open position.

1. Valves: Grind away portion of exposed valve stem. Bolt switch, with plunger in stem depression, to OS&Y gate-valve yoke.
2. Indicator Posts: Drill and thread hole in upper-barrel section at target plate. Install switch, with toggle against target plate, on barrel of indicator post.

C. Locking and Sealing: Secure unsupervised valves as follows:

1. Valves: Install chain and padlock on open OS&Y gate valve.
2. Post Indicators: Install padlock on wrench on indicator post.

D. Pressure Switches: Drill and thread hole in exposed barrel of fire hydrant. Install switch.

E. Water-Flow Indicators: Install in water-service piping in vault. Select indicator with saddle and vane matching pipe size. Drill hole in pipe, insert vane, and bolt saddle to pipe.

F. Connect alarm devices to building's fire-alarm system. Wiring and fire-alarm devices are specified in Division 28 Sections.

3.13 CONNECTIONS

A. Connect fire-suppression water-service piping to utility water main. Use tapping method as allowed by the governing agency.

B. Connect fire-suppression water-service piping to interior fire-suppression piping.

C. Connect waste piping from concrete vault drains to sanitary sewerage system. Comply with local jurisdictional requirements.

3.14 FIELD QUALITY CONTROL

A. Use test procedure prescribed by authorities having jurisdiction or, if method is not prescribed by authorities having jurisdiction, use procedure described below.

B. Piping Tests: Conduct piping tests before joints are covered and after concrete thrust blocks have hardened sufficiently. Fill pipeline 24 hours before testing and apply test pressure to stabilize system. Use only potable water.

C. Hydrostatic Tests: Test at not less than one-and-one-half times the working pressure for two hours.

1. Increase pressure in 50-psig increments and inspect each joint between increments. Hold at test pressure for one hour; decrease to 0 psig. Slowly increase again to test pressure and hold for one more hour. Maximum allowable leakage is 2 quarts per hour per 100 joints. Remake leaking joints with new materials and repeat test until leakage is within allowed limits.

D. Prepare test and inspection reports.

3.15 IDENTIFICATION

A. Install continuous underground detectable warning tape during backfilling of trench for underground fire-suppression water-service piping. Locate below finished grade, directly over piping.

B. Permanently attach equipment nameplate or marker indicating plastic fire-suppression water-service piping or fire-suppression water-service piping with electrically insulated fittings, on main electrical meter panel.

3.16 CLEANING

A. Clean and disinfect fire-suppression water-service piping as follows:

1. Purge new piping systems and parts of existing systems that have been altered, extended, or repaired before use.
2. Use purging and disinfecting procedure prescribed by authorities having jurisdiction or, if method is not prescribed by authorities having jurisdiction, use procedure described in NFPA 24 for flushing of piping. Flush piping system with clean, potable water until dirty water does not appear at points of outlet.
3. Use purging and disinfecting procedure prescribed by authorities having jurisdiction or, if method is not prescribed by authorities having jurisdiction, use procedure described in AWWA C651 or do as follows:

a. Fill system or part of system with water/chlorine solution containing at least 50 ppm of chlorine; isolate and allow to stand for 24 hours.
b. Drain system or part of system of previous solution and refill with water/chlorine solution containing at least 200 ppm of chlorine; isolate and allow to stand for three hours.
c. After standing time, flush system with clean, potable water until no chlorine remains in water coming from system.
d. Submit water samples in sterile bottles to authorities having jurisdiction. Repeat procedure if biological examination shows evidence of contamination.

B. Prepare reports of purging and disinfecting activities.

3.17 PIPING SCHEDULE

A. Underground fire-suppression water-service piping NPS 2 and smaller shall be hard copper tube, ASTM B 88, Type K; wrought-copper, solder-joint fittings; and brazed joints.

B. Underground and under slab fire-suppression water-service piping NPS 3 to NPS 6 shall be one of the following:

1. Grooved-end, ductile-iron pipe; grooved-end, ductile-iron pipe appurtenances; and grooved joints.
2. Mechanical-joint, ductile-iron pipe; mechanical-joint, ductile- or gray-iron, standard-pattern or ductile-iron, compact-pattern fittings; glands, gaskets, and bolts; and gasketed joints.
3. Push-on-joint, ductile-iron pipe; push-on-joint, ductile-iron compact-pattern fittings; and gasketed joints.

C. Meter box fire-suppression water-service piping NPS 2 and smaller shall be hard copper tube, ASTM B 88, Type K; wrought- or cast-copper-alloy, solder-joint fittings; and brazed joints.

D. Vault fire-suppression water-service piping NPS 3 to NPS 6 shall be grooved-end, ductile-iron pipe; grooved-end, ductile-iron pipe appurtenances; and grooved joints.

3.18 VALVE SCHEDULE

A. Drawings indicate valve types to be used. Where specific valve types are not indicated, the following requirements apply:

B. Underground fire-suppression water-service shutoff valves NPS 2 and smaller shall be corporation valves or curb valves with ends compatible with piping.

C. Meter box fire-suppression water-service shutoff valves NPS 2 and smaller shall be meter valves.

D. Vault fire-suppression water-service shutoff valves NPS 2 and smaller shall be Class 125, MSS, bronze, non-rising stem gate valves.

E. Underground fire-suppression water-service shutoff valves NPS 3 and larger shall be one of the following:

1. 200-psig, AWWA, iron, non-rising-stem, metal or resilient-seated gate valves.
2. 175-psig, UL-listed or FM-approved, iron, non-rising-stem gate valves.

F. Indicator-post underground fire-suppression water-service valves NPS 3 and larger shall be 175-psig, UL-listed or FM-approved, iron, non-rising-stem gate valves with indicator-post flange.

G. Standard-pressure, vault fire-suppression water-service shutoff valves NPS 3 and larger shall be one of the following:

1. 200-psig, AWWA, iron, OS&Y, metal or resilient-seated gate valves.
2. 175-psig, UL-listed or FM-approved, iron, OS&Y gate valves.

END OF SECTION 211100

SECTION 21 12 00 - FIRE-SUPPRESSION STANDPIPES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Pipes, fittings, and specialties.
2. Fire-protection valves.
3. Hose connections.
4. Fire-department connections.
5. Alarm devices.
6. Pressure gages.

B. Related Sections:

1. Division 21 Section "Wet-Pipe Sprinkler Systems" for wet-pipe sprinkler piping.
2. Division 28 Section "**Digital, Addressable Fire-Alarm System**" for alarm devices not specified in this Section.

1.2 SYSTEM DESCRIPTIONS

A. Automatic Wet-Type, Class I Standpipe System: Includes NPS 2-1/2 hose connections. Has open water-supply valve with pressure maintained and is capable of supplying water demand.

B. Automatic Wet-Type, Class II Standpipe System: Includes NPS 1-1/2 hose stations. Has open water-supply valve with pressure maintained and is capable of supplying water demand.

C. Automatic Wet-Type, Class III Standpipe System: Includes NPS 1-1/2 hose stations and NPS 2-1/2 hose connections. Has open water-supply valve with pressure maintained and is capable of supplying water demand.

D. Manual Dry-Type, Class I Standpipe System: Includes NPS 2-1/2 hose connections. Does not have permanent water supply. Piping is dry. Water must be pumped into standpipes to satisfy demand.

1.3 PERFORMANCE REQUIREMENTS

A. Fire-Suppression Standpipe System Component: Listed for 175-psig minimum working pressure.

B. Delegated Design: Design fire-suppression standpipes, including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria indicated.

C. Fire-suppression standpipe design shall be approved by authorities having jurisdiction.

1. Minimum residual pressure at each hose-connection outlet is as follows:

a. NPS 1-1/2 Hose Connections: 65 psig.
b. NPS 2-1/2 Hose Connections: 100 psig.

2. Maximum residual pressure at required flow at each hose-connection outlet is as follows unless otherwise indicated:

a. NPS 1-1/2 Hose Connections: 100 psig.
b. NPS 2-1/2 Hose Connections: 175 psig.

D. Seismic Performance: Fire-suppression standpipes shall withstand the effects of earthquake motions determined according to NFPA 13 and local requirements by the agency having jurisdiction.

1.4 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: For fire-suppression standpipes. Include plans, elevations, sections, details, and attachments to other work.

1. Wiring Diagrams: For power, signal, and control wiring.

C. Delegated-Design Submittal: For standpipe systems indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

D. Qualification Data: For qualified Installer.

E. Approved Standpipe Drawings: Working plans, prepared according to NFPA 14, that have been approved by authorities having jurisdiction, including hydraulic calculations if applicable.

F. Welding certificates.

G. Field Test Reports and Certificates: Indicate and interpret test results for compliance with performance requirements and as described in NFPA 14. Include "Contractor's Material and Test Certificate for Aboveground Piping" and "Contractor's Material and Test Certificate for Underground Piping."

H. Field quality-control reports.

I. Operation and maintenance data.

1.5 QUALITY ASSURANCE

A. Installer Qualifications:

1. Installer's responsibilities include designing, fabricating, and installing fire-suppression standpipes and providing professional engineering services needed to assume engineering responsibility. Base calculations on results of fire-hydrant flow test.

B. Welding Qualifications: Qualify procedures and operators according to ASME Boiler and Pressure Vessel Code.

C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

D. NFPA Standards: Fire-suppression standpipe equipment, specialties, accessories, installation, and testing shall comply with NFPA 14, "Installation of Standpipe and Hose Systems."

PART 2 - PRODUCTS

2.1 PIPING MATERIALS

A. Comply with requirements in "Piping Schedule" Article for applications of pipe, tube, and fitting materials, and for joining methods for specific services, service locations, and pipe sizes.

2.2 STEEL PIPE AND FITTINGS

A. Standard Weight, Galvanized- and Black-Steel Pipe: ASTM A 53/A 53M, Type E, Grade B. Pipe ends may be factory or field formed to match joining method.

B. Schedule 30, Galvanized- and Black-Steel Pipe: ASTM A 135; ASTM A 795/A 795M, Type E; or ASME B36.10M, wrought steel; with wall thickness not less than Schedule 30 and not more than Schedule 40. Pipe ends may be factory or field formed to match joining method.

C. Thinwall Galvanized- and Black-Steel Pipe: ASTM A 135 or ASTM A 795/A 795M, threadable, with wall thickness less than Schedule 30 and equal to or greater than Schedule 10. Pipe ends may be factory or field formed to match joining method.

D. Standard-Weight, Galvanized- and Black-Steel Pipe Nipples: ASTM A 733, made of ASTM A 53/A 53M, seamless steel pipe with threaded ends.

E. Galvanized and Uncoated, Steel Couplings: ASTM A 865, threaded.

F. Galvanized and Uncoated, Gray-Iron Threaded Fittings: ASME B16.4, Class 125, standard pattern.

G. Malleable- or Ductile-Iron Unions: UL 860.

H. Cast-Iron Flanges: ASME B16.1, Class 125.

I. Steel Flanges and Flanged Fittings: ASME B16.5, Class 150.

J. Steel Welding Fittings: ASTM A 234/A 234M and ASME B16.9.

K. Grooved-Joint, Steel-Pipe Appurtenances:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

   a. Anvil International, Inc.
   b. Corcoran Piping System Co.
   c. National Fittings, Inc.
   d. Shurjoint Piping Products.
   e. Tyco Fire & Building Products LP.
   f. Victaulic Company.

2. Pressure Rating: 175 psig minimum.
3. Galvanized and Uncoated, Grooved-End Fittings for Steel Piping: ASTM A 47/A 47M, malleable-iron casting or ASTM A 536, ductile-iron casting; with dimensions matching steel pipe.
4. Grooved-End-Pipe Couplings for Steel Piping: AWWA C606 and UL 213, rigid pattern, unless otherwise indicated, for steel-pipe dimensions. Include ferrous housing sections, EPDM-rubber gasket, and bolts and nuts.

2.3 PIPING JOINING MATERIALS

A. Pipe-Flange Gasket Materials: AWWA C110, rubber, flat face, 1/8 inch thick or ASME B16.21, nonmetallic and asbestos free.

1. Class 125, Cast-Iron Flat-Face Flanges: Full-face gaskets.

B. Metal, Pipe-Flange Bolts and Nuts: ASME B18.2.1, carbon steel unless otherwise indicated.

C. Welding Filler Metals: Comply with AWS D10.12M/D10.12 for welding materials appropriate for wall thickness and chemical analysis of steel pipe being welded.

2.4 LISTED FIRE-PROTECTION VALVES

A. General Requirements:

1. Valves shall be UL listed or FM approved.
2. Minimum Pressure Rating: 175 psig.

B. Check Valves:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
2. Basis-of-Design Product: Subject to compliance with requirements, provide or comparable product by one of the following:

a. AFAC Inc.
b. American Cast Iron Pipe Company; Waterous Company Subsidiary.
c. Anvil International, Inc.
d. Clow Valve Company; a division of McWane, Inc.
e. Crane Co.; Crane Valve Group; Crane Valves.
f. Crane Co.; Crane Valve Group; Jenkins Valves.
g. Crane Co.; Crane Valve Group; Stockham Division.
h. Fire-End & Croker Corporation.
i. Fire Protection Products, Inc.
j. Fivalco Inc.
k. Globe Fire Sprinkler Corporation.
l. Groeniger & Company.
m. Kennedy Valve; a division of McWane, Inc.
n. Matco-Norca.
o. Metraflex, Inc.
p. Milwaukee Valve Company.
q. Mueller Co.; Water Products Division.
r. NIBCO INC.
s. Potter Roemer.
t. Reliable Automatic Sprinkler Co., Inc.
u. Shurjoint Piping Products.
v. Tyco Fire & Building Products LP.
w. United Brass Works, Inc.
x. Venus Fire Protection Ltd.
y. Victaulic Company.
z. Viking Corporation.
aa. Watts Water Technologies, Inc.

3. Standard: UL 312.
4. Pressure Rating: 250 psig minimum.
5. Type: Swing check.
6. Body Material: Cast iron.
7. End Connections: Flanged or grooved.

C. Bronze OS&Y Gate Valves:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
2. Basis-of-Design Product: Subject to compliance with requirements, provide or comparable product by one of the following:

a. Crane Co.; Crane Valve Group; Crane Valves.
b. Crane Co.; Crane Valve Group; Stockham Division.
c. Milwaukee Valve Company.
d. NIBCO INC.
e. United Brass Works, Inc.

3. Standard: UL 262.
4. Pressure Rating: 175 psig.

5. Body Material: Bronze.
6. End Connections: Threaded.

D. Iron OS&Y Gate Valves:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
2. Basis-of-Design Product: Subject to compliance with requirements, provide or comparable product by one of the following:

    a. American Cast Iron Pipe Company; Waterous Company Subsidiary.
    b. American Valve, Inc.
    c. Clow Valve Company; a division of McWane, Inc.
    d. Crane Co.; Crane Valve Group; Crane Valves.
    e. Crane Co.; Crane Valve Group; Jenkins Valves.
    f. Crane Co.; Crane Valve Group; Stockham Division.
    g. Hammond Valve.
    h. Milwaukee Valve Company.
    i. Mueller Co.; Water Products Division.
    j. NIBCO INC.
    k. Shurjoint Piping Products.
    l. Tyco Fire & Building Products LP.
    m. United Brass Works, Inc.
    n. Watts Water Technologies, Inc.

3. Standard: UL 262.
4. Pressure Rating: 250 psig minimum.
5. Body Material: Cast or ductile iron.
6. End Connections: Flanged or grooved.

E. Indicating-Type Butterfly Valves:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
2. Basis-of-Design Product: Subject to compliance with requirements, provide or comparable product by one of the following:

    a. Anvil International, Inc.
    b. Fivalco Inc.
    c. Global Safety Products, Inc.
    d. Kennedy Valve; a division of McWane, Inc.
    e. Milwaukee Valve Company.
    f. NIBCO INC.
    g. Shurjoint Piping Products.
    h. Tyco Fire & Building Products LP.
    i. Victaulic Company.

3. Standard: UL 1091.

4. Pressure Rating: 175 psig minimum.
5. Valves NPS 2 and Smaller:

    a. Valve Type: Ball or butterfly.
    b. Body Material: Bronze.
    c. End Connections: Threaded.

6. Valves NPS 2-1/2 and Larger:

    a. Valve Type: Butterfly.
    b. Body Material: Cast or ductile iron.
    c. End Connections: Flanged, grooved, or wafer.

7. Valve Operation: Integral electrical, 115-V ac, prewired, single-circuit, supervisory switch, electrical, 115-V ac, prewired, two-circuit, supervisory switch or visual indicating device as required by the agency having jurisdiction.

2.5 HOSE CONNECTIONS

A. Adjustable-Valve Hose Connections:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
2. Basis-of-Design Product: Subject to compliance with requirements, provide or comparable product by one of the following:

    a. AFAC Inc.
    b. Elkhart Brass Mfg. Company, Inc.
    c. Fire-End & Croker Corporation.
    d. Fire Protection Products, Inc.
    e. GMR International Equipment Corporation.
    f. Guardian Fire Equipment, Inc.
    g. Potter Roemer.
    h. Tyco Fire & Building Products LP.
    i. Wilson & Cousins Inc.
    j. Zurn Plumbing Products Group; Wilkins Water Control Products Division.

3. Standard: UL 668 hose valve, with integral UL 1468 reducing or restricting pressure-control device, for connecting fire hose.
4. Pressure Rating: 300 psig minimum.
5. Material: Brass or bronze.
6. Size: NPS 1-1/2 or NPS 2-1/2, as indicated.
7. Inlet: Female pipe threads.
8. Outlet: Male hose threads with lugged cap, gasket, and chain. Include hose valve threads according to NFPA 1963 and matching local fire-department threads.
9. Pressure-Control Device Type: Pressure reducing or restricting as required by the agency having jurisdiction.

10. Design Outlet Pressure Setting: As required by agency having jurisdiction and based on design requirements by the life safety designer / engineer.
11. Finish: Rough brass or bronze.

B. Nonadjustable-Valve Hose Connections:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
2. Basis-of-Design Product: Subject to compliance with requirements, provide or comparable product by one of the following:

    a. AFAC Inc.
    b. Elkhart Brass Mfg. Company, Inc.
    c. Fire-End & Croker Corporation.
    d. Fire Protection Products, Inc.
    e. GMR International Equipment Corporation.
    f. Guardian Fire Equipment, Inc.
    g. Kennedy Valve; a division of McWane, Inc.
    h. Mueller Co.; Water Products Division.
    i. NIBCO INC.
    j. Potter Roemer.
    k. Tyco Fire & Building Products LP.
    l. Wilson & Cousins Inc.

3. Standard: UL 668 hose valve for connecting fire hose.
4. Pressure Rating: 300 psig minimum.
5. Material: Brass or bronze.
6. Size: NPS 1-1/2 or NPS 2-1/2, as indicated.
7. Inlet: Female pipe threads.
8. Outlet: Male hose threads with lugged cap, gasket, and chain. Include hose valve threads according to NFPA 1963 and matching local fire-department threads.
9. Finish: Rough brass or bronze.

2.6 FIRE-DEPARTMENT CONNECTIONS

A. Flush-Type, Fire-Department Connection:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
2. Basis-of-Design Product: Subject to compliance with requirements, provide or comparable product by one of the following:

    a. AFAC Inc.
    b. Elkhart Brass Mfg. Company, Inc.
    c. GMR International Equipment Corporation.
    d. Guardian Fire Equipment, Inc.
    e. Potter Roemer.

3. Standard: UL 405.
4. Type: Flush, for wall mounting.
5. Pressure Rating: 175 psig minimum.
6. Body Material: Corrosion-resistant metal.
7. Inlets: Brass with threads according to NFPA 1963 and matching local fire-department sizes and threads. Include extension pipe nipples, brass lugged swivel connections, and check devices or clappers.
8. Caps: Brass, lugged type, with gasket and chain.
9. Escutcheon Plate: Rectangular, brass, wall type.
10. Outlet: With pipe threads.
11. Body Style: Horizontal or Vertical.
12. Number of Inlets: Three.
13. Escutcheon Plate Marking: Similar to "AUTO SPKR & STANDPIPE."
14. Finish: Rough brass or bronze.
15. Outlet Size: NPS 6.

2.7 ALARM DEVICES

A. Alarm-device types shall match piping and equipment connections.

B. Water-Flow Indicators:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

    a. ADT Security Services, Inc.
    b. McDonnell & Miller; ITT Industries.
    c. Potter Electric Signal Company.
    d. System Sensor; a Honeywell company.
    e. Viking Corporation.
    f. Watts Industries (Canada) Inc.

2. Standard: UL 346.
3. Water-Flow Detector: Electrically supervised.
4. Components: Two single-pole, double-throw circuit switches for isolated alarm and auxiliary contacts, 7 A, 125-V ac and 0.25 A, 24-V dc; complete with factory-set, field-adjustable retard element to prevent false signals and tamperproof cover that sends signal if removed.
5. Type: Paddle operated.
6. Pressure Rating: 250 psig.
7. Design Installation: Horizontal or vertical.

C. Valve Supervisory Switches:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. Fire-Lite Alarms, Inc.; a Honeywell company.
b. Kennedy Valve; a division of McWane, Inc.
c. Potter Electric Signal Company.
d. System Sensor; a Honeywell company.

2. Standard: UL 346.
3. Type: Electrically supervised.
4. Components: Single-pole, double-throw switch with normally closed contacts.
5. Design: Signals that controlled valve is in other than fully open position.

2.8 PRESSURE GAGES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. AMETEK; U.S. Gauge Division.
2. Ashcroft Inc.
3. Brecco Corporation.
4. WIKA Instrument Corporation.

B. Standard: UL 393.

C. Dial Size: 3-1/2- to 4-1/2-inch diameter.

D. Pressure Gage Range: 0 to 250 psig minimum.

E. Water System Piping Gage: Include "WATER" or "AIR/WATER" label on dial face.

PART 3 - EXECUTION

3.1 SERVICE-ENTRANCE PIPING

A. Connect fire-suppression standpipe piping to water-service piping at service entrance into building. Comply with requirements for exterior piping in Division 21 Section "Facility Fire-Suppression Water-Service Piping."

B. Install shutoff valve, backflow preventer, pressure gage, drain, and other accessories at connection to fire-suppression water-service piping. Comply with requirements for backflow preventers in Division 21 Section "Facility Fire-Suppression Water-Service Piping."

C. Install shutoff valve, check valve, pressure gage, and drain at connection to water service.

3.2 WATER-SUPPLY CONNECTIONS

A. Connect fire-suppression standpipe piping to building's interior water-distribution piping. Comply with requirements for interior piping in Division 22 Section "Domestic Water Piping."

B. Install shutoff valve, backflow preventer, pressure gage, drain, and other accessories at connection to water-distribution piping.

C. Install shutoff valve, check valve, pressure gage, and drain at connection to water supply.

3.3 PIPING INSTALLATION

A. Locations and Arrangements: Drawing plans, schematics, and diagrams indicate general location and arrangement of piping. Install piping as indicated, as far as practical.

1. Deviations from approved working plans for piping require written approval from authorities having jurisdiction. File written approval with Architect before deviating from approved working plans.

B. Piping Standard: Comply with requirements in NFPA 14 for installation of fire-suppression standpipe piping.

C. Install seismic restraints on piping. Comply with requirements in NFPA 13 for seismic-restraint device materials and installation.

D. Install listed fittings to make changes in direction, branch takeoffs from mains, and reductions in pipe sizes.

E. Install drain valves on standpipes. Extend drain piping to outside of building.

F. Install automatic (ball drip) drain valves to drain piping between fire-department connections and check valves. Drain to floor drain or outside building.

G. Install alarm devices in piping systems.

H. Install hangers and supports for standpipe system piping according to NFPA 14. Comply with requirements in NFPA 13 for hanger materials.

I. Install pressure gages on riser or feed main and at top of each standpipe. Include pressure gages with connection not less than NPS 1/4 and with soft-metal seated globe valve, arranged for draining pipe between gage and valve. Install gages to permit removal, and install where they will not be subject to freezing.

J. Drain dry-type standpipe system piping.

K. Pressurize and check dry-type standpipe system piping.

L. Fill wet-type standpipe system piping with water.

M. Install electric heating cables and pipe insulation on wet-type, fire-suppression standpipe piping in areas subject to freezing.

N. Install sleeves for piping penetrations of walls, ceilings, and floors.

O. Install sleeve seals for piping penetrations of concrete walls and slabs.

P. Install escutcheons for piping penetrations of walls, ceilings, and floors.

3.4 JOINT CONSTRUCTION

A. Install couplings, flanges, flanged fittings, unions, nipples, and transition and special fittings that have finish and pressure ratings same as or higher than system's pressure rating for aboveground applications unless otherwise indicated.

B. Install unions adjacent to each valve in pipes NPS 2 and smaller.

C. Install flanges, flange adapters, or couplings for grooved-end piping on valves, apparatus, and equipment having NPS 2-1/2 and larger end connections.

D. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.

E. Remove scale, slag, dirt, and debris from inside and outside of pipes, tubes, and fittings before assembly.

F. Flanged Joints: Select appropriate gasket material in size, type, and thickness suitable for water service. Join flanges with gasket and bolts according to ASME B31.9.

G. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:

1. Apply appropriate tape or thread compound to external pipe threads.
2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged.

H. Steel-Piping, Cut-Grooved Joints: Cut square-edge groove in end of pipe according to AWWA C606. Assemble coupling with housing, gasket, lubricant, and bolts. Join steel pipe and grooved-end fittings according to AWWA C606 for steel-pipe joints.

I. Steel-Piping, Roll-Grooved Joints: Roll rounded-edge groove in end of pipe according to AWWA C606. Assemble coupling with housing, gasket, lubricant, and bolts. Join steel pipe and grooved-end fittings according to AWWA C606 for steel-pipe grooved joints.

J. Welded Joints: Construct joints according to AWS D10.12M/D10.12, using qualified processes and welding operators according to "Quality Assurance" Article.

1. Shop weld pipe joints where welded piping is indicated. Do not use welded joints for galvanized-steel pipe.

K. Dissimilar-Material Piping Joints: Make joints using adapters compatible with materials of both piping systems.

3.5 VALVE AND SPECIALTIES INSTALLATION

A. Install listed fire-protection valves, trim and drain valves, specialty valves and trim, controls, and specialties according to NFPA 14 and authorities having jurisdiction.

B. Install listed fire-protection shutoff valves supervised-open, located to control sources of water supply except from fire-department connections. Install permanent identification signs indicating portion of system controlled by each valve.

C. Install check valve in each water-supply connection. Install backflow preventers instead of check valves in potable-water-supply sources.

3.6 HOSE-CONNECTION INSTALLATION

A. Install hose connections adjacent to standpipes.

B. Install freestanding hose connections for access and minimum passage restriction.

C. Install NPS 1-1/2 hose-connection valves with flow-restricting device.

D. Install NPS 2-1/2 hose connections with quick-disconnect NPS 2-1/2 by NPS 1-1/2 reducer adapter and flow-restricting device.

E. Install wall-mounted-type hose connections in cabinets. Include pipe escutcheons, with finish matching valves, inside cabinet where water-supply piping penetrates cabinet. Install valves at angle required for connection of fire hose.

3.7 FIRE-DEPARTMENT CONNECTION INSTALLATION

A. Install wall-type, fire-department connections.

B. Install automatic (ball drip) drain valve at each check valve for fire-department connection.

3.8 IDENTIFICATION

A. Install labeling and pipe markers on equipment and piping according to requirements in NFPA 14.

B. Identify system components, wiring, cabling, and terminals. Comply with requirements for identification specified in Division 26 Section "Identification for Electrical Systems."

3.9 FIELD QUALITY CONTROL

A. Perform tests and inspections.

B. Tests and Inspections:

1. Leak Test: After installation, charge systems and test for leaks. Repair leaks and retest until no leaks exist.
2. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
3. Flush, test, and inspect standpipe systems according to NFPA 14, "System Acceptance" Chapter.
4. Energize circuits to electrical equipment and devices.
5. Coordinate with fire-alarm tests. Operate as required.
6. Coordinate with fire-pump tests. Operate as required.
7. Verify that equipment hose threads are same as local fire-department equipment.

C. Fire-suppression standpipe system will be considered defective if it does not pass tests and inspections.

D. Prepare test and inspection reports.

3.10 PIPING SCHEDULE

A. Piping between Fire-Department Connections and Check Valves: Galvanized, standard-weight steel pipe with threaded ends; cast-iron threaded fittings; and threaded, grooved ends; grooved-end fittings; grooved-end-pipe couplings; and grooved joints, as required by the agency having jurisdiction.

B. Wet-type, fire-suppression standpipe piping, NPS 4 and smaller, shall be:

1. Schedule 40 black steel pipe, threaded with black cast iron standard weight screwed sprinkler fittings. Thin wall steel pipe with welded connections is acceptable, providing approvals are received from all local governing agencies and no insurance penalties are suffered.

C. Wet-type, fire-suppression standpipe piping, NPS 5 and NPS 6, shall be one of the following:

1. Schedule 40 black steel pipe, threaded with black cast iron standard weight screwed sprinkler fittings. Thin wall steel pipe with welded connections is acceptable, providing approvals are received from all local governing agencies and no insurance penalties are suffered.

END OF SECTION 211200

SECTION 211313 - WET-PIPE SPRINKLER SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Pipes, fittings, and specialties.
2. Fire-protection valves.
3. Fire-department connections.
4. Sprinklers.
5. Alarm devices.
6. Pressure gages.

B. Related Sections:

1. Division 21 Section "Fire-Suppression Standpipes" for standpipe piping.

1.2 SYSTEM DESCRIPTIONS

A. Wet-Pipe Sprinkler System: Automatic sprinklers are attached to piping containing water and that is connected to water supply through alarm valve. Water discharges immediately from sprinklers when they are opened. Sprinklers open when heat melts fusible link or destroys frangible device. Hose connections are included if indicated.

1.3 PERFORMANCE REQUIREMENTS

A. Standard-Pressure Piping System Component: Listed for 175-psig minimum working pressure.

B. Delegated Design: Design sprinkler system(s), including comprehensive engineering analysis by a qualified professional engineer, using performance requirements and design criteria as required by the agency having jurisdiction.

C. Sprinkler system design shall be approved by authorities having jurisdiction.

1. Margin of Safety for Available Water Flow and Pressure: 20 percent, including losses through water-service piping, valves, and backflow preventers.

2. Minimum Density for Automatic-Sprinkler Piping Design:

a. Residential (Dwelling) Occupancy: 0.05 gpm over 400-sq. ft. area.

b. Light-Hazard Occupancy: 0.10 gpm over 1500-sq. ft. area.
c. Ordinary-Hazard, Group 1 Occupancy: 0.15 gpm over 1500-sq. ft. area.
d. Ordinary-Hazard, Group 2 Occupancy: 0.20 gpm over 1500-sq. ft. area.
e. Extra-Hazard, Group 1 Occupancy: 0.30 gpm over 2500-sq. ft. area.
f. Extra-Hazard, Group 2 Occupancy: 0.40 gpm over 2500-sq. ft. area.
g. Special Occupancy Hazard: As determined by authorities having jurisdiction.

3. Maximum Protection Area per Sprinkler: Per UL listing.
4. Maximum Protection Area per Sprinkler:

a. Residential Areas: 400 sq. ft..
b. Office Spaces: 120 sq. ft.
c. Storage Areas: 130 sq. ft..
d. Mechanical Equipment Rooms: 130 sq. ft..
e. Electrical Equipment Rooms: 130 sq. ft..
f. Other Areas: According to NFPA 13 recommendations unless otherwise indicated.

5. Total Combined Hose-Stream Demand Requirement: According to NFPA 13 unless otherwise indicated:

a. Light-Hazard Occupancies: 100 gpm for 30 minutes.
b. Ordinary-Hazard Occupancies: 250 gpm for 60 to 90 minutes.
c. Extra-Hazard Occupancies: 500 gpm for 90 to 120 minutes

D. Seismic Performance: Sprinkler piping shall withstand the effects of earthquake motions determined according to NFPA 13 and ASCE/SEI 7.

1.4 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: For wet-pipe sprinkler systems. Include plans, elevations, sections, details, and attachments to other work.

1. Wiring Diagrams: For power, signal, and control wiring.

C. Delegated-Design Submittal: For sprinkler systems indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

D. Qualification Data: For qualified Installer and professional engineer.

E. Approved Sprinkler Piping Drawings: Working plans, prepared according to NFPA 13, that have been approved by authorities having jurisdiction, including hydraulic calculations if applicable.

F. Welding certificates.

G. Field Test Reports and Certificates: Indicate and interpret test results for compliance with performance requirements and as described in NFPA 13. Include "Contractor's Material and Test Certificate for Aboveground Piping."

H. Field quality-control reports.

I. Operation and maintenance data.

1.5 QUALITY ASSURANCE

A. Installer Qualifications:

1. Installer's responsibilities include designing, fabricating, and installing sprinkler systems and providing professional engineering services needed to assume engineering responsibility. Base calculations on results of fire-hydrant flow test.

    a. Engineering Responsibility: Preparation of working plans, calculations, and field test reports by a qualified professional engineer.

B. Welding Qualifications: Qualify procedures and operators according to ASME Boiler and Pressure Vessel Code.

C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

D. NFPA Standards: Sprinkler system equipment, specialties, accessories, installation, and testing shall comply with the following:

1. NFPA 13, "Installation of Sprinkler Systems."
2. NFPA 13R, "Installation of Sprinkler Systems in Residential Occupancies up to and Including Four Stories in Height."
3. NFPA 24, "Installation of Private Fire Service Mains and Their Appurtenances."

PART 2 - PRODUCTS

2.1 PIPING MATERIALS

A. Comply with requirements in "Piping Schedule" Article for applications of pipe, tube, and fitting materials, and for joining methods for specific services, service locations, and pipe sizes.

2.2 STEEL PIPE AND FITTINGS

A. Above ground piping shall be Schedule 40 black steel pipe, threaded with black cast iron standard weight screwed sprinkler fittings. Thin wall steel pipe with welded connections is acceptable, providing approvals are received from all local governing agencies and no insurance penalties are suffered.

B. Galvanized- and Black-Steel Pipe Nipples: ASTM A 733, made of ASTM A 53/A 53M, standard-weight, seamless steel pipe with threaded ends.

C. Galvanized and Uncoated, Steel Couplings: ASTM A 865, threaded.

D. Galvanized and Uncoated, Gray-Iron Threaded Fittings: ASME B16.4, Class 125, standard pattern.

E. Malleable- or Ductile-Iron Unions: UL 860.

F. Cast-Iron Flanges: ASME 16.1, Class 125.

G. Steel Flanges and Flanged Fittings: ASME B16.5, Class 150.

H. Steel Welding Fittings: ASTM A 234/A 234M and ASME B16.9.

I. Grooved-Joint, Steel-Pipe Appurtenances:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

    a. Anvil International, Inc.
    b. Corcoran Piping System Co.
    c. National Fittings, Inc.
    d. Shurjoint Piping Products.
    e. Tyco Fire & Building Products LP.
    f. Victaulic Company.

2. Pressure Rating: 175 psig minimum.

3. Galvanized and Uncoated, Grooved-End Fittings for Steel Piping: ASTM A 47/A 47M, malleable-iron casting or ASTM A 536, ductile-iron casting; with dimensions matching steel pipe.
4. Grooved-End-Pipe Couplings for Steel Piping: AWWA C606 and UL 213, rigid pattern, unless otherwise indicated, for steel-pipe dimensions. Include ferrous housing sections, EPDM-rubber gasket, and bolts and nuts.

J. Steel Pressure-Seal Fittings: UL 213, FM-approved, 175-psig pressure rating with steel housing, rubber O-rings, and pipe stop; for use with fitting manufacturers' pressure-seal tools.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. Victaulic Company.

2.3 PIPING JOINING MATERIALS

A. Pipe-Flange Gasket Materials: AWWA C110, rubber, flat face, 1/8 inch thick or ASME B16.21, nonmetallic and asbestos free.

1. Class 125, Cast-Iron Flat-Face Flanges: Full-face gaskets.

B. Metal, Pipe-Flange Bolts and Nuts: ASME B18.2.1, carbon steel unless otherwise indicated.

C. Welding Filler Metals: Comply with AWS D10.12M/D10.12 for welding materials appropriate for wall thickness and chemical analysis of steel pipe being welded.

2.4 LISTED FIRE-PROTECTION VALVES

A. General Requirements:

1. Valves shall be UL listed or FM approved.
2. Minimum Pressure Rating: 175 psig.

B. Check Valves:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
2. Basis-of-Design Product: Subject to compliance with requirements, provide or comparable product by one of the following:

a. AFAC Inc.
b. American Cast Iron Pipe Company; Waterous Company Subsidiary.
c. Anvil International, Inc.
d. Clow Valve Company; a division of McWane, Inc.
e. Crane Co.; Crane Valve Group; Crane Valves.
f. Crane Co.; Crane Valve Group; Jenkins Valves.
g. Crane Co.; Crane Valve Group; Stockham Division.
h. Fire-End & Croker Corporation.
i. Fire Protection Products, Inc.
j. Fivalco Inc.
k. Globe Fire Sprinkler Corporation.
l. Groeniger & Company.
m. Kennedy Valve; a division of McWane, Inc.
n. Matco-Norca.
o. Metraflex, Inc.
p. Milwaukee Valve Company.
q. Mueller Co.; Water Products Division.
r. NIBCO INC.
s. Potter Roemer.
t. Reliable Automatic Sprinkler Co., Inc.
u. Shurjoint Piping Products.
v. Tyco Fire & Building Products LP.
w. United Brass Works, Inc.
x. Venus Fire Protection Ltd.
y. Victaulic Company.
z. Viking Corporation.
aa. Watts Water Technologies, Inc.

3. Standard: UL 312.
4. Pressure Rating: 250 psig minimum.
5. Type: Swing check.
6. Body Material: Cast iron.
7. End Connections: Flanged or grooved.

C. Bronze OS&Y Gate Valves:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
2. Basis-of-Design Product: Subject to compliance with requirements, provide or comparable product by one of the following:

a. Crane Co.; Crane Valve Group; Crane Valves.
b. Crane Co.; Crane Valve Group; Stockham Division.
c. Milwaukee Valve Company.
d. NIBCO INC.

e. United Brass Works, Inc.

3. Standard: UL 262.
4. Pressure Rating: 175 psig.
5. Body Material: Bronze.
6. End Connections: Threaded.

D. Iron OS&Y Gate Valves:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
2. Basis-of-Design Product: Subject to compliance with requirements, provide or comparable product by one of the following:

a. American Cast Iron Pipe Company; Waterous Company Subsidiary.
b. American Valve, Inc.
c. Clow Valve Company; a division of McWane, Inc.
d. Crane Co.; Crane Valve Group; Crane Valves.
e. Crane Co.; Crane Valve Group; Jenkins Valves.
f. Crane Co.; Crane Valve Group; Stockham Division.
g. Hammond Valve.
h. Milwaukee Valve Company.
i. Mueller Co.; Water Products Division.
j. NIBCO INC.
k. Shurjoint Piping Products.
l. Tyco Fire & Building Products LP.
m. United Brass Works, Inc.
n. Watts Water Technologies, Inc.

3. Standard: UL 262.
4. Pressure Rating: 250 psig minimum.
5. Body Material: Cast or ductile iron.
6. End Connections: Flanged or grooved.

E. Indicating-Type Butterfly Valves:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
2. Basis-of-Design Product: Subject to compliance with requirements, provide or comparable product by one of the following:

a. Anvil International, Inc.
b. Fivalco Inc.
c. Global Safety Products, Inc.

d. Kennedy Valve; a division of McWane, Inc.
e. Milwaukee Valve Company.
f. NIBCO INC.
g. Shurjoint Piping Products.
h. Tyco Fire & Building Products LP.
i. Victaulic Company.

3. Standard: UL 1091.
4. Pressure Rating: 175 psig minimum.
5. Valves NPS 2 and Smaller:

a. Valve Type: Ball or butterfly.
b. Body Material: Bronze.
c. End Connections: Threaded.

6. Valves NPS 2-1/2 and Larger:

a. Valve Type: Butterfly.
b. Body Material: Cast or ductile iron.
c. End Connections: Flanged, grooved, or wafer.

7. Valve Operation: Integral electrical, 115-V ac, prewired, single-circuit, supervisory switch, electrical, 115-V ac, prewired, two-circuit, supervisory switch or visual indicating device.

2.5 TRIM AND DRAIN VALVES

A. General Requirements:

1. Standard: UL's "Fire Protection Equipment Directory" listing or "Approval Guide," published by FM Global, listing.
2. Minimum Pressure Rating: 175 psig.

B. Ball Valves:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. Affiliated Distributors.
b. Anvil International, Inc.
c. Barnett.
d. Conbraco Industries, Inc.; Apollo Valves.
e. Fire-End & Croker Corporation.
f. Fire Protection Products, Inc.
g. Flowserve.

h. FNW.
i. Jomar International, Ltd.
j. Kennedy Valve; a division of McWane, Inc.
k. Kitz Corporation.
l. Legend Valve.
m. Metso Automation USA Inc.
n. Milwaukee Valve Company.
o. NIBCO INC.
p. Potter Roemer.
q. Red-White Valve Corporation.
r. Southern Manufacturing Group.
s. Stewart, M. A. and Sons Ltd.
t. Tyco Fire & Building Products LP.
u. Victaulic Company.
v. Watts Water Technologies, Inc.

2.6 SPECIALTY VALVES

A. General Requirements:

1. Standard: UL's "Fire Protection Equipment Directory" listing or "Approval Guide," published by FM Global, listing.
2. Minimum Pressure Rating: 175 psig (1200 kPa).
3. Body Material: Cast or ductile iron.
4. Size: Same as connected piping.
5. End Connections: Flanged or grooved.

B. Alarm Valves:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
2. Basis-of-Design Product: Subject to compliance with requirements, provide or comparable product by one of the following:

a. AFAC Inc.
b. Globe Fire Sprinkler Corporation.
c. Reliable Automatic Sprinkler Co., Inc.
d. Tyco Fire & Building Products LP.
e. Venus Fire Protection Ltd.
f. Victaulic Company.
g. Viking Corporation.

3. Standard: UL 193.
4. Design: For horizontal or vertical installation.

5. Include trim sets for bypass, drain, electrical sprinkler alarm switch, pressure gages, retarding chamber, and fill-line attachment with strainer.
6. Drip Cup Assembly: Pipe drain without valves and separate from main drain piping.
7. Drip Cup Assembly: Pipe drain with check valve to main drain piping.

C. Automatic (Ball Drip) Drain Valves:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

    a. AFAC Inc.
    b. Reliable Automatic Sprinkler Co., Inc.
    c. Tyco Fire & Building Products LP.

2. Standard: UL 1726.
3. Pressure Rating: 175 psig minimum.
4. Type: Automatic draining, ball check.
5. Size: NPS 3/4.
6. End Connections: Threaded.

2.7 FIRE-DEPARTMENT CONNECTIONS

A. Flush-Type, Fire-Department Connection:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
2. Basis-of-Design Product: Subject to compliance with requirements, provide or comparable product by one of the following:

    a. AFAC Inc.
    b. Elkhart Brass Mfg. Company, Inc.
    c. GMR International Equipment Corporation.
    d. Guardian Fire Equipment, Inc.
    e. Potter Roemer.

3. Standard: UL 405.
4. Type: Flush, for wall mounting.
5. Pressure Rating: 175 psig minimum.
6. Body Material: Corrosion-resistant metal.
7. Inlets: Brass with threads according to NFPA 1963 and matching local fire-department sizes and threads. Include extension pipe nipples, brass lugged swivel connections, and check devices or clappers.
8. Caps: Brass, lugged type, with gasket and chain.

9. Escutcheon Plate: Rectangular, brass, wall type.
10. Outlet: With pipe threads.
11. Body Style: Horizontal or Vertical.
12. Number of Inlets: Three.
13. Escutcheon Plate Marking: Similar to "AUTO SPKR & STANDPIPE."
14. Finish: Rough brass or bronze.
15. Outlet Size: NPS 6.

2.8 SPRINKLER SPECIALTY PIPE FITTINGS

A. Branch Outlet Fittings:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

    a. Anvil International, Inc.
    b. National Fittings, Inc.
    c. Shurjoint Piping Products.
    d. Tyco Fire & Building Products LP.
    e. Victaulic Company.

2. Standard: UL 213.
3. Pressure Rating: 175 psig minimum.
4. Body Material: Ductile-iron housing with EPDM seals and bolts and nuts.
5. Type: Mechanical-T and -cross fittings.
6. Configurations: Snap-on and strapless, ductile-iron housing with branch outlets.
7. Size: Of dimension to fit onto sprinkler main and with outlet connections as required to match connected branch piping.
8. Branch Outlets: Grooved, plain-end pipe, or threaded.

B. Flow Detection and Test Assemblies:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

    a. AGF Manufacturing Inc.
    b. Reliable Automatic Sprinkler Co., Inc.
    c. Tyco Fire & Building Products LP.
    d. Victaulic Company.

2. Standard: UL's "Fire Protection Equipment Directory" listing or "Approval Guide," published by FM Global, listing.
3. Pressure Rating: 175 psig minimum.

4. Body Material: Cast- or ductile-iron housing with orifice, sight glass, and integral test valve.
5. Size: Same as connected piping.
6. Inlet and Outlet: Threaded.

C. Branch Line Testers:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

    a. Elkhart Brass Mfg. Company, Inc.
    b. Fire-End & Croker Corporation.
    c. Potter Roemer.

2. Standard: UL 199.
3. Pressure Rating: 175 psig minimum.
4. Body Material: Brass.
5. Size: Same as connected piping.
6. Inlet: Threaded.
7. Drain Outlet: Threaded and capped.
8. Branch Outlet: Threaded, for sprinkler.

D. Sprinkler Inspector's Test Fittings:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

    a. AGF Manufacturing Inc.
    b. Triple R Specialty.
    c. Tyco Fire & Building Products LP.
    d. Victaulic Company.
    e. Viking Corporation.

2. Standard: UL's "Fire Protection Equipment Directory" listing or "Approval Guide," published by FM Global, listing.
3. Pressure Rating: 175 psig minimum.
4. Body Material: Cast- or ductile-iron housing with sight glass.
5. Size: Same as connected piping.
6. Inlet and Outlet: Threaded.

E. Adjustable Drop Nipples:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. CECA, LLC.
b. Corcoran Piping System Co.
c. Merit Manufacturing; a division of Anvil International, Inc.

2. Standard: UL 1474.
3. Pressure Rating: 250 psig minimum.
4. Body Material: Steel pipe with EPDM-rubber O-ring seals.
5. Size: Same as connected piping.
6. Length: Adjustable.
7. Inlet and Outlet: Threaded.

F. Flexible, Sprinkler Hose Fittings:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. Fivalco Inc.
b. FlexHead Industries, Inc.
c. Gateway Tubing, Inc.

2. Standard: UL 1474.
3. Type: Flexible hose for connection to sprinkler, and with bracket for connection to ceiling grid.
4. Pressure Rating: 175 psig minimum.
5. Size: Same as connected piping, for sprinkler.

2.9 SPRINKLERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. AFAC Inc.
2. Globe Fire Sprinkler Corporation.
3. Reliable Automatic Sprinkler Co., Inc.
4. Tyco Fire & Building Products LP.
5. Venus Fire Protection Ltd.
6. Victaulic Company.
7. Viking Corporation.

B. General Requirements:

1. Standard: UL's "Fire Protection Equipment Directory" listing or "Approval Guide," published by FM Global, listing.
2. Pressure Rating for Residential Sprinklers: 175 psig maximum.

3. Pressure Rating for Automatic Sprinklers: 175 psig minimum.
4. Pressure Rating for High-Pressure Automatic Sprinklers: 250 psig.

C. Automatic Sprinklers with Heat-Responsive Element:

1. Early-Suppression, Fast-Response Applications: UL 1767.
2. Nonresidential Applications: UL 199.
3. Characteristics: Nominal 1/2-inch orifice with Discharge Coefficient K of 5.6, and for "Ordinary" temperature classification rating unless otherwise indicated or required by application.

D. Sprinkler Finishes:

1. Chrome plated.
2. Bronze.
3. Painted.

E. Special Coatings:

1. Wax.
2. Lead.
3. Corrosion-resistant paint.

F. Sprinkler Escutcheons: Materials, types, and finishes for the following sprinkler mounting applications. Escutcheons for concealed, flush, and recessed-type sprinklers are specified with sprinklers.

1. Ceiling Mounting: Chrome-plated steel, two piece, with 1-inch vertical adjustment.
2. Sidewall Mounting: Chrome-plated steel, one piece, flat.

G. Sprinkler Guards:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

   a. Reliable Automatic Sprinkler Co., Inc.
   b. Tyco Fire & Building Products LP.
   c. Victaulic Company.
   d. Viking Corporation.

2. Standard: UL 199.
3. Type: Wire cage with fastening device for attaching to sprinkler.

2.10 ALARM DEVICES

A. Alarm-device types shall match piping and equipment connections.

B. Water-Motor-Operated Alarm:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

   a. Globe Fire Sprinkler Corporation.
   b. Tyco Fire & Building Products LP.
   c. Victaulic Company.
   d. Viking Corporation.

2. Standard: UL 753.
3. Type: Mechanically operated, with Pelton wheel.
4. Alarm Gong: Cast aluminum with red-enamel factory finish.
5. Size: 10-inch diameter.
6. Components: Shaft length, bearings, and sleeve to suit wall construction.
7. Inlet: NPS 3/4.
8. Outlet: NPS 1 drain connection.

C. Water-Flow Indicators:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

   a. ADT Security Services, Inc.
   b. McDonnell & Miller; ITT Industries.
   c. Potter Electric Signal Company.
   d. System Sensor; a Honeywell company.
   e. Viking Corporation.
   f. Watts Industries (Canada) Inc.

2. Standard: UL 346.
3. Water-Flow Detector: Electrically supervised.
4. Components: Two single-pole, double-throw circuit switches for isolated alarm and auxiliary contacts, 7 A, 125-V ac and 0.25 A, 24-V dc; complete with factory-set, field-adjustable retard element to prevent false signals and tamperproof cover that sends signal if removed.
5. Type: Paddle operated.
6. Pressure Rating: 250 psig.
7. Design Installation: Horizontal or vertical.

D. Valve Supervisory Switches:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

    a. Fire-Lite Alarms, Inc.; a Honeywell company.
    b. Kennedy Valve; a division of McWane, Inc.
    c. Potter Electric Signal Company.
    d. System Sensor; a Honeywell company.

2. Standard: UL 346.
3. Type: Electrically supervised.
4. Components: Single-pole, double-throw switch with normally closed contacts.
5. Design: Signals that controlled valve is in other than fully open position.

2.11 PRESSURE GAGES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. AMETEK; U.S. Gauge Division.
2. Ashcroft, Inc.
3. Brecco Corporation.
4. WIKA Instrument Corporation.

B. Standard: UL 393.

C. Dial Size: 3-1/2- to 4-1/2-inch diameter.

D. Pressure Gage Range: 0 to 250 psig minimum.

E. Water System Piping Gage: Include "WATER" or "AIR/WATER" label on dial face.

PART 3 - EXECUTION

3.1 SERVICE-ENTRANCE PIPING

A. Connect sprinkler piping to water-service piping for service entrance to building. Comply with requirements for exterior piping in Division 21 Section "Facility Fire-Suppression Water-Service Piping."

B. Install shutoff valve, backflow preventer, pressure gage, drain, and other accessories indicated at connection to water-service piping.

C. Install shutoff valve, check valve, pressure gage, and drain at connection to water service.

3.2 WATER-SUPPLY CONNECTIONS

A. Connect sprinkler piping to building's interior water-distribution piping. Comply with requirements for interior piping in Division 22 Section "Domestic Water Piping."

B. Install shutoff valve, backflow preventer, pressure gage, drain, and other accessories indicated at connection to water-distribution piping.

C. Install shutoff valve, check valve, pressure gage, and drain at connection to water supply.

3.3 PIPING INSTALLATION

A. Locations and Arrangements: Drawing plans, schematics, and diagrams indicate general location and arrangement of piping. Install piping as indicated, as far as practical.

1. Deviations from approved working plans for piping require written approval from authorities having jurisdiction. File written approval with Architect before deviating from approved working plans.

B. Piping Standard: Comply with requirements for installation of sprinkler piping in NFPA 13.

C. Install seismic restraints on piping. Comply with requirements for seismic-restraint device materials and installation in NFPA 13.

D. Use listed fittings to make changes in direction, branch takeoffs from mains, and reductions in pipe sizes.

E. Install unions adjacent to each valve in pipes NPS 2 and smaller.

F. Install flanges, flange adapters, or couplings for grooved-end piping on valves, apparatus, and equipment having NPS 2-1/2 and larger end connections.

G. Install "Inspector's Test Connections" in sprinkler system piping, complete with shutoff valve, and sized and located according to NFPA 13.

H. Install sprinkler piping with drains for complete system drainage.

I. Install sprinkler control valves, test assemblies, and drain risers adjacent to standpipes when sprinkler piping is connected to standpipes.

J. Install automatic (ball drip) drain valve at each check valve for fire-department connection, to drain piping between fire-department connection and check valve. Install drain piping to and spill over floor drain or to outside building.

K. Install alarm devices in piping systems.

L. Install hangers and supports for sprinkler system piping according to NFPA 13. Comply with requirements for hanger materials in NFPA 13.

M. Install pressure gages on riser or feed main, at each sprinkler test connection, and at top of each standpipe. Include pressure gages with connection not less than NPS 1/4 (DN 8) and with soft metal seated globe valve, arranged for draining pipe between gage and valve. Install gages to permit removal, and install where they will not be subject to freezing.

N. Fill sprinkler system piping with water.

O. Install electric heating cables and pipe insulation on sprinkler piping in areas subject to freezing. Comply with requirements for heating cables in Division 21 "Heat Tracing for Fire-Suppression Piping" and for piping insulation in Division 21 Section "Fire-Suppression Systems Insulation."

P. Install sleeves for piping penetrations of walls, ceilings, and floors. Comply with requirements for sleeves specified in Division 21 Section "Sleeves and Sleeve Seals for Fire-Suppression Piping."

Q. Install sleeve seals for piping penetrations of concrete walls and slabs. Comply with requirements for sleeve seals specified in Division 21 Section "Sleeves and Sleeve Seals for Fire-Suppression Piping."

R. Install escutcheons for piping penetrations of walls, ceilings, and floors. Comply with requirements for escutcheons specified in Division 21 Section "Escutcheons for Fire-Suppression Piping."

3.4 JOINT CONSTRUCTION

A. Install couplings, flanges, flanged fittings, unions, nipples, and transition and special fittings that have finish and pressure ratings same as or higher than system's pressure rating for aboveground applications unless otherwise indicated.

B. Install unions adjacent to each valve in pipes NPS 2 and smaller.

C. Install flanges, flange adapters, or couplings for grooved-end piping on valves, apparatus, and equipment having NPS 2-1/2 and larger end connections.

D. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.

E. Remove scale, slag, dirt, and debris from inside and outside of pipes, tubes, and fittings before assembly.

F. Flanged Joints: Select appropriate gasket material in size, type, and thickness suitable for water service. Join flanges with gasket and bolts according to ASME B31.9.

G. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:

1. Apply appropriate tape or thread compound to external pipe threads.
2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged.

H. Twist-Locked Joints: Insert plain end of steel pipe into plain-end-pipe fitting. Rotate retainer lugs one-quarter turn or tighten retainer pin.

I. Steel-Piping, Pressure-Sealed Joints: Join light wall steel pipe and steel pressure-seal fittings with tools recommended by fitting manufacturer.

J. Welded Joints: Construct joints according to AWS D10.12M/D10.12, using qualified processes and welding operators according to "Quality Assurance" Article.

1. Shop weld pipe joints where welded piping is indicated. Do not use welded joints for galvanized-steel pipe.

K. Steel-Piping, Cut-Grooved Joints: Cut square-edge groove in end of pipe according to AWWA C606. Assemble coupling with housing, gasket, lubricant, and bolts. Join steel pipe and grooved-end fittings according to AWWA C606 for steel-pipe joints.

L. Steel-Piping, Roll-Grooved Joints: Roll rounded-edge groove in end of pipe according to AWWA C606. Assemble coupling with housing, gasket, lubricant, and bolts. Join steel pipe and grooved-end fittings according to AWWA C606 for steel-pipe grooved joints.

M. Steel-Piping, Pressure-Sealed Joints: Join Schedule 5 steel pipe and steel pressure-seal fittings with tools recommended by fitting manufacturer.

N. Dissimilar-Material Piping Joints: Make joints using adapters compatible with materials of both piping systems.

3.5 VALVE AND SPECIALTIES INSTALLATION

A. Install listed fire-protection valves, trim and drain valves, specialty valves and trim, controls, and specialties according to NFPA 13 and authorities having jurisdiction.

B. Install listed fire-protection shutoff valves supervised open, located to control sources of water supply except from fire-department connections. Install permanent identification signs indicating portion of system controlled by each valve.

C. Install check valve in each water-supply connection. Install backflow preventers instead of check valves in potable-water-supply sources.

D. Specialty Valves:

1. General Requirements: Install in vertical position for proper direction of flow, in main supply to system.
2. Alarm Valves: Include bypass check valve and retarding chamber drain-line connection.

3.6 SPRINKLER INSTALLATION

A. Install sprinklers in suspended ceilings in center of narrow dimension **of** acoustical ceiling panels.

B. Install dry-type sprinklers with water supply from heated space. Do not install pendent or sidewall, wet-type sprinklers in areas subject to freezing.

C. Install sprinklers into flexible, sprinkler hose fittings and install hose into bracket on ceiling grid.

3.7 FIRE-DEPARTMENT CONNECTION INSTALLATION

A. Install wall-type, fire-department connections.

B. Install automatic (ball drip) drain valve at each check valve for fire-department connection.

3.8 IDENTIFICATION

A. Install labeling and pipe markers on equipment and piping according to requirements in NFPA 13.

B. Identify system components, wiring, cabling, and terminals. Comply with requirements for identification specified in Division 26 Section "Identification for Electrical Systems."

3.9 FIELD QUALITY CONTROL

A. Perform tests and inspections.

B. Tests and Inspections:

1. Leak Test: After installation, charge systems and test for leaks. Repair leaks and retest until no leaks exist.
2. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
3. Flush, test, and inspect sprinkler systems according to NFPA 13, "Systems Acceptance" Chapter.
4. Energize circuits to electrical equipment and devices.
5. Coordinate with fire-alarm tests. Operate as required.
6. Coordinate with fire-pump tests. Operate as required.
7. Verify that equipment hose threads are same as local fire-department equipment.

C. Sprinkler piping system will be considered defective if it does not pass tests and inspections.

D. Prepare test and inspection reports.

3.10 CLEANING

A. Clean dirt and debris from sprinklers.

B. Remove and replace sprinklers with paint other than factory finish.

3.11 PIPING SCHEDULE

A. Piping between Fire-Department Connections and Check Valves: Galvanized, standard-weight steel pipe with threaded ends; cast-iron threaded fittings; and threaded or grooved ends; grooved-end fittings; grooved-end-pipe couplings; and grooved joints.

B. Sprinkler specialty fittings may be used, downstream of control valves, instead of specified fittings.

C. Wet-pipe sprinkler system, NPS 2 and smaller, shall be:

1. Schedule 40 black steel pipe, threaded with black cast iron standard weight screwed sprinkler fittings. Thin wall steel pipe with welded connections is acceptable, providing approvals are received from all local governing agencies and no insurance penalties are suffered.

D. Standard-pressure, wet-pipe sprinkler system, NPS 2-1/2 to NPS 6, shall be:

1. Schedule 40 black steel pipe, threaded with black cast iron standard weight screwed sprinkler fittings. Thin wall steel pipe with welded connections is acceptable, providing approvals are received from all local governing agencies and no insurance penalties are suffered.

3.12 SPRINKLER SCHEDULE

A. Use sprinkler types in subparagraphs below for the following applications:

1. Rooms without Ceilings: Upright sprinklers.
2. Rooms with Suspended Ceilings: Pendent, recessed, flush, and concealed sprinklers as indicated.
3. Wall Mounting: Sidewall sprinklers.
4. Spaces Subject to Freezing: Upright, pendent, dry sprinklers; and sidewall, dry sprinklers as indicated.
5. Special Applications: Extended-coverage, flow-control, and quick-response sprinklers where indicated.

B. Provide sprinkler types in subparagraphs below with finishes indicated.

1. Concealed Sprinklers: Rough brass, with factory-painted white cover plate.
2. Flush Sprinklers: Bright chrome, with painted white escutcheon.
3. Recessed Sprinklers: Bright chrome, with bright chrome escutcheon.
4. Upright, Pendent and Sidewall Sprinklers: Chrome plated in finished spaces exposed to view; rough bronze in unfinished spaces not exposed to view; wax coated where exposed to acids, chemicals, or other corrosive fumes.

END OF SECTION 211313

SECTION 22 00 00 – PLUMBING

PART 1 – GENERAL

1.01 Requirements of Division 00 and Division 01 apply to the Work of this Section.

1.02 DESCRIPTION OF WORK: Provide complete Plumbing System as outlined on the drawings, including excavation and backfilling for underground work, and air conditioning unit condensate lines and gas piping.

A. The Work Included: All labor, materials, appliances, tools, equipment, facilities, transportation, and services necessary for and incidental to performing all operations of the Work of this Section, complete as indicated on the drawings and as specified herein. The Work includes, but not limited to, the following:

1. Examine all other sections for the Work related to those other sections and required to be included as the Work under this Section.
2. Submittals.
3. All soils, waste and vent as indicated on the drawings.
4. Roof drainage system as indicated on the drawings.
5. All hot and cold water systems.
6. Furnishing and setting of plumbing fixtures, etc.
7. Plumbing connections, waste, vent and water piping to fixtures.
8. Indirect lines from all air conditioning equipment.
9. Water for temporary connections and tests.
10. Flashing of pipes passing through roof, etc.
11. Flashing roof drains and overflow drains, etc.

B. Related Work Specified in Other Sections:

The following items are covered by the indicated other sections of these Specifications. Coordinate as required with all other trades to ensure proper and adequate provision for installation of the items described in this Section.

1.	Hardware:	Section 08 71 00
2.	Painting:	Section 09 91 00
3.	HVAC:	Section 23 00 00 or 23 00 10
4.	Electrical:	Section 26 00 00

1.03 SUBMITTALS:

A. Product Data: Submit manufacturer’s technical data including catalog plate for each type of fixture and accessory required.

B. Certificate of Performance: Furnish two (2) copies of a certificate of performance of complete sterilization of water lines to the Architect before final acceptance.

1.04 QUALITY ASSURANCE: Comply with the Uniform Plumbing Code, latest edition, and all local, county, state, federal codes, ordinances, rules and regulations. Comply with all

referenced commercial standards, specifications, codes, rules, etc., including current addenda and errata.

1.05 PROJECT CONDITIONS:

A. The drawings are diagrammatic:
   1. General Drawings: Structural, Architectural, Electrical and other Mechanical Drawings are a part of this Work.
   2. Before submitting the bid, each bidder shall carefully examine all Drawings and Specifications, visit site, and fully inform himself to perform the Work.
   3. Intent of Drawings:
      a. Where design exceeds code requirements, design must be followed.
      b. Drawings accompanying this Specification indicate in diagrammatic form, arrangements desired for principal apparatus, piping, etc., and shall be followed as closely as possible.

B. Provide a temporary water supply for testing of systems.

C. Test complete system according to the standards of the Uniform Plumbing Code, latest edition.

D. Maintain throughout the project a complete set of the drawings with all changes clearly recorded. The drawings shall be kept in a clean and neat condition and shall be accessible to the Architect at all times. At the conclusion of the project work with the General Contractor to transfer all notes to a set of Record Documents to be prepared for submission to the Owner.

E. Wrap all steel pipes for corrosion protection per soils report.

1.06 COOPERATION WITH OTHER TRADES: The Contractor shall coordinate his bid and work with all other trades to make sure each and every item shall been covered. No additional compensation shall be allowed for any controversies arising between the Subcontractors.

1.07 UTILITY SERVICE:

A. Sewer: Connect to lateral at 5’ from building as shown on the drawings.

B. Water: Connect water as shown on the drawings. Service line to water meter is under another contract or section of these specifications.

1.08 CONFLICT BETWEEN CONTRACT DOCUMENTS: In the event of conflicting requirements between items of the drawings or between items in the specifications or between items on the drawings and in the specifications, the more stringent or costly shall

govern, unless decided otherwise by the Engineer, who shall be the sole judge in these matters.

1.09 SPECIAL PROJECT GUARANTEE: The Contractor is responsible for all Work under this Section. The Contractor shall leave the system in perfect operating condition and shall repair and replace, at his own expense, any defect within one (1) year after the date of final acceptance of the Work.

PART 2 – PRODUCTS

2.01 PIPE SCHEDULE:

A. Soil, waste, roof drainage, and vent lines below floor shall be service weight cast-iron pipe.

B. Soil, waste, and vent piping installed above ground shall be service weight cast-iron pipe and fittings in sizes 4” and larger.

C. Waste and vent piping 3” and smaller installed above ground may be standard weight galvanized steel pipe with Durham fittings for waste lines and standard black cast-iron fittings for vent lines or service weight cast-iron pipe and fittings.

D. Water Piping: Domestic piping shall be Type L copper with sweated connections.

E. Indirect drains shall be Type M copper with sweated connections.

F. Roof drainage, planter drainage piping above grade may be service weight cast-iron pipe with coupling or galvanized steel pipe and fittings.

G. Gas Piping: Schedule 40 black steel pipe with screwed malleable fittings. Use plastic-coated pipe and fittings on lines exposed to weather.

2.02 PIPE MATERIALS, FITTINGS AND VALVES:

A. Cast-Iron Soil Pipe and Fittings: Service weight casts iron conforming to No-Hub Type CISPI #301-78.

B. Galvanized or Black Iron Pipe: Standard weight cast iron drainage type fittings for galvanized waste steel lines. Wrought copper fittings for copper lines.

C. Fittings: Service weight cast-iron drainage type fittings for galvanized waste steel lines. Wrought copper fittings for copper lines.

D. Valves shall conform to the following:
1. 3” and Smaller: Carne #428, or approved equal, bronze, screwed, rising stem.

2.03 FLASHING:

A. Open Top Vent Pipe:
1. Minimum 2 ½" lb. lead flashing sleeve. Prime both sides of flange and set in roofing mastic. Crimp top of lead sleeve one inch back down into pipe.

B. Roof Drains and Overflow Drains:
1. Furnish and install four-pound (4-lb.) lead flashing under roofing and fitted into roof drains and overflow drains as manufactured by:

Elmdor/Stoneman
1745 One Hunley Street
City of Industry, CA 91744
(626) 968-8699

2. Flashing can be performed in factory when ordering.

2.04 PIPE HANGERS:

A. Water Piping: Super Strut C-711F split ring hangers with supporting rods.

B. Soil and Waste Piping: Super Strut CL-710 hangers with supporting rods. Use riser clamps at floor Super Strut C-720.

C.

Pipe Size	Hanger Rod Dia.
Up to 2"	3/8"

2.05 CLEANOUTS:

A. Floors: Smith #4023 with round nickel bronze top in finished room floors. Smith #4223 with round cast-iron in unfinished room floor.

B. Finished Walls: Smith #4532 with round chrome-plated or stainless steel access plate and screw.

C. Cleanout plugs shall be extra heavy bronze plugs.

2.06 ACCESS BOXES:

A. Walls: Smith #4730 with polished chrome face in tile walls. Use Smith #4760 AKL with bonderized prime-coated steel face in plaster walls.

B. Ceilings: Acorn #8211-3 AKL bonderized prime-coated steel face with Allen lock.

2.07 FIXTURES AND EQUIPMENT: All fixtures to have water saving devices as required. See drawings for complete information.

PART 3 – EXECUTION

3.01 PREPARATION: Lay out system prior to installation. Rough-in fixtures according to manufacturer's templates and diagrams.

A. No material or equipment shall be used in any manner or for any purpose not recommended by the manufacturer.

B. In all cases where the manufacturers or articles used furnish directions covering points not shown on the drawings or herein specified, such directions shall be followed.

3.02 APPLICATIONS: Obtain all permits, inspections, etc., required by the Code and furnish a certificate of approval from the inspection authority at completion. The Contractor shall pay for all permits, meter installations, and fees relating to his Work, unless noted otherwise. Any assessment fees will be paid by the Owner. Provide all materials for a complete plumbing system. In all finished areas conceal all piping unless noted otherwise.

A. Locate air conditioning unit condensate and gas piping in attic space above finished ceiling.

3.03 INSTALLATION:

A. Cast-Iron Pipe Joints: No-hub type joints using stainless steel bands above grade and below grade.

B. Cleanouts: Install cleanouts at all bends, angles, and ends of all waste and sewer piping and where noted on the drawings. All cleanouts shall be brought to grade and in all cases shall be accessible. Cleanouts shall not be located under or behind fixtures unless accessible. Verify where cleanouts will be considered accessible. All cleanout threads shall be thoroughly greased when installed.

C. Water Lines: Securely attach to walls, studs, etc. Isolate all such piping from the structure by a ½" thick felt pad wrapped around piping.

D. Backflow Prevention: Provide and install backflow prevention devices where indicated on the drawings and where required by the local ordinances.

E. Where maximum water pressure exceeds 80 psig, or where indicated, it will be the Contractor's responsibility to verify, furnish, and install a complete pressure regulating valve system. Provide pressure gauges on each side of regulator. Install gauge cocks ahead of each gauge.

F. Flashing:
1. Open Top Vent Pipe Installation: Seal the neck of the flashing to the pipe with Permaseal Water-Proofing compound and secure the counter-flashing

to the pipe with vandal proof set screws. Fill the top annular space with epoxy compound.

3.04 VALVES: All valves shall be located in accessible places. Where it is necessary to install valve bodies in walls, ceilings, or sidewalks, provide access panels with valve wheels and bonnets in accessible locations. Gate valves shall be used on all lines requiring valves to be wide open or tight shut. Remove insides of valves before soldering valve to pipe.

3.05 PROTECTION:

A. Close all waste, vent, water, and other pipe openings by means of a test plug, screw cap, or other fitting.

B. All traps in closet bowls and lavatories shall be closed so that no debris can enter. Drains shall be provided with an inner topping and shall be plugged during construction.

C. Water closets, laboratories, and other fixtures shall be covered with wooden frames securely fastened in place.

D. On completion of the Work, remove all protecting coverings, thoroughly clean all fixtures, polish all bright work, and leave work in neat, clean condition.

E. Where required to prevent sweating, indirect lines for air conditioning units which run above ceiling or in walls shall be insulated.

3.06 TRENCH EXCAVATION:

A. Excavate all trenches for pipe work. Trenches for pipe assembly shall be sufficient width to permit proper assembly of pipe. Excavate trenches for cast-iron soil pipe to a true gradient in a manner that willfully support pipe on subgrade and with adequate bell holes at proper intervals.

B. Provide and maintain all necessary guard rails, covers, or other protective structures as required by the regulations or the Engineer.

C. Upon completion of pipe work, all trenches shall be backfilled and compacted. Trenches shall be backfilled to spring line of pipe, moistened, and thoroughly tamped with mechanical tampers to not less than 90 percent of maximum density. Balance of backfill to be in lifts not over 6" thick. Each lift shall be mechanically tamped to 90 percent of maximum density.

D. All backfilling of trenches containing wrapped pipe shall be done with sand to a level of 6" above the top of the pipe.

E. Promptly remove all water from all trenches or other excavations. Furnish pumps, attendants, and other facilities as required to keep the excavations dry until completion of the Work.

3.07 TESTS:

A. All tests shall be made in strict accordance with all applicable ordinances or as outlined below. If requirements of ordinances are more restrictive, they shall be followed.

B. All tests shall be made in the presence of and to the satisfaction of local governing agencies. Test procedures shall be held for a minimum of 4 hours without showing any leakage.

C. Entire soil, waste, and drainage system shall be tested under water pressure of 175 psig.

D. All cold water piping shall be tested under a hydrostatic pressure of 175 psig.

3.08 CLEANUP: After plumbing work has been tested and approved, the Contractor shall thoroughly clean all parts of the equipment and piping installation. Exposed parts which are to be painted shall be thoroughly cleaned of cement, plaster, and other materials, all grease or oil spots removed, and the material left in proper condition to receive paint finish.

3.09 STERILIZATION OF WATER LINES:

A. Sterilize each unit of water supply and distribution system with chlorine before acceptance for operation.

B. Materials:
1. Liquid chlorine conforming to U.S. Army Specification #4-1.
2. Hyprochlorite conforming to Federal Specification C-B-441-A and amendment 2, Grade D.
3. Minimum dosage of chlorine to be 50 parts per million.

C. Procedure to be followed:
   1. Allow contact period of not less than 8 hours. Then flush system with clean water until residual content is not greater than 0.2 parts per million.
   2. Flush the entire system, including hose bibs, fixture outlets, dead ends, and other points where dead water tends to collect.
   3. Open and close all valves several times during contact period. Provide isolation valves as required.

3.10 FIXTURES AND TRIMS:

A. All fixtures shall be securely attached to supporting surfaces as specified and installed plumb and level. Grout behind all wall-hung plumbing fixtures with white, durable plastic material, eliminating all cracks and voids.

B. Separately valve every supply to every fixture and piece of equipment requiring various services with lockshield loose key stops.

C. All connections to fixtures shall be made with drop ear elbows secured to building structure, and outlet of elbow shall be screwed. Connections from elbow to fixture supply pipe are made with 85 percent red brass chrome-plated nipple.

D. Wall-hung fixtures, except as specified otherwise, for steel studs shall be securely attached to ¼" thick by 6" wide steel plate with 5/16" steel studs and nuts. Plate shall extend at least 1 stud beyond the first and last fixture mounting points. The plate shall be securely welded to each stud or as indicated with fixtures. In wood stud construction, plate shall be carefully recessed, flush with face of studs and securely attached to each stud with 2 ½" steel bolts on 4" centers with 1/8" thick by 1 ½" wide steel backup plates.

END OF SECTION

SECTION 23 00 00 – HEATING, VENTILATING AND AIR CONDITIONING

PART 1 – GENERAL

1.01 Requirements of Division 00 and Division 01 apply to the Work of this Section.

1.02 DESCRIPTION OF WORK: Provide complete air conditioning and heating system as outlined on the drawings and as required by the conditions at the project location. Condensate drains shall be installed by the Plumbing subcontractor, low voltage wiring shall be provided by the Electrical subcontractor.

A. Related Documents: Plumbing is specified in Section 22 00 00 and Electrical is specified in section 26 00 00.

1.03 SUBMITTALS:

A. Product Data: Submit manufacturer's product data including all equipment and apparatuses.

B. Furnish three (3) bound copies of the operation and maintenance instruction at completion of the project. Include parts list, descriptive data, and service instructions for all equipment.

1.04 QUALITY ASSURANCE:

A. Comply with all local, county, state, and federal codes, ordinances, rules and regulations including Title 24, Division T20, Article, "Energy Conservation Standards for Nonresidential Buildings", and including current addenda and errata. Comply with all referenced commercial standards and specifications.

B. Provide a Certificate of Approval from the inspection authority at the completion of the project.

1.05 PROJECT CONDITIONS:

A. Obtain and pay for all permits, inspections, etc.

B. Rooftop equipment shall be painted, prepare equipment by masking labels, cleaning, etc.

C. Coordinate with Electrical subcontractor for temporary power for system testing prior to completion of the project.

1.06 SPECIAL PROJECT WARRANTY:

A. Air conditioning unit compressors shall have a full five (5) year warranty.

B. All other equipment and apparatuses furnished and installed under the Contract shall have a one (1) year warranty.

PART 2 – PRODUCTS

2.01 MATERIALS:

A. Air conditioning units shall be as manufactured by Carrier, Day and Night, Lennox, Trane or York. Diffusers shall be manufactured by Titus, ADP, Kreuger, Barber-Colman or Carnes. Units shall be self-contained with High Efficiency (SEER 14 rating minimum), down draft with factory roof curbs, complete with factory economizer and fully factory charged with R-410A refrigerant. Size and quantity shall be selected to provide a quiet, draft-free installation.

B. Ductwork shall be galvanized steel, constructed per SMACNA and Mechanical Code requirements, and installed with 11/2" thick fiberglass (use 2" thickness where design ambient exceeds 98° FDB). Insulated flexible runouts to outlets with a maximum length of 6'-0" are acceptable. Exposed ductwork shall be insulated with 1" thick duct liner. Provide all sheet metal equipment platform covers.

C. All time clock thermostats, magnetic starters, relays, control devices, etc. shall be provided as shown on the drawings.

D. Toilet exhaust fans shall be ceiling mounted type with backdraft damper, roofjack, bird screen and connecting ductwork.

PART 3 – EXECUTION

3.01 PREPARATION: Layout system prior to installation. Coordinate the actual location of air conditioning units with the Architect. Obtain approval prior to installation. Refer to the drawings for additional requirements.

3.02 CLEANING AND PROTECTION: Protect newly installed equipment until completion of project. Clean, test, and adjust as required for proper performance. System shall be balanced and adjusted and be in proper operating condition prior to final inspection.

END OF SECTION

SECTION 26 00 00 – ELECTRICAL

PART 1 – GENERAL

1.01 Requirements of Division 00 and Division 01 apply to the Work of this Section.

1.02 DESCRIPTION OF WORK: Provide complete electrical, telephone, and cable TV system (if shown) as indicated and as required by the conditions at the project location. Provide wiring as required for HVAC system.

A. Related Documents: Excavating and Backfilling is specified in Section 31 23 00, Heating, Ventilating and Air Conditioning is specified in Section 23 00 00 or 23 00 10.

1.03 SUBMITTALS:

A. Product Data: Submit manufacturer's product data for each equipment item and light fixture specified.

B. Shop Drawings: Furnish drawings for main switchboards, distribution boards, and panel boards indicating front elevations with dimension and width of gutters.
1. Indicate proof of U.L. or other recognized test laboratory's approval.
2. Shop Drawings shall use the same nomenclature indicated on the drawings and include wording for required nameplates.

1.04 QUALITY ASSURANCE:

A. Comply with all governing codes including: the National Electric Code, applicable edition enforced by the local authority; CAL-OSHA, State Fire Marshal, State and Municipal Building and Electrical Safety ordinances and serving utility companies laws and regulations; and California Title 24, lighting fixtures and related control equipment shall be CEC approved.

B. Provide a Certificate of Approval from the inspection authority at the completion of the project.

C. Provide a report of tests required at the completion of the project.

1.05 PROJECT CONDITIONS:

A. Obtain and pay for all plan check fees, permits, licenses, inspections, etc. Make detailed arrangements with utility companies for previously selected service. Pay all fees and costs levied.

B. Provide empty power service conduits only with pull wire from the building main switchboards to 5'-0" away from building line. Size and number shall be as

indicated on drawings. Intercept existing service conduit already stubbed out under site work, provide all fittings and/or pull boxes and connect complete as required by the power company. Coordinate stub out locations with the Site Contractor. Include all costs in bid, including cable charges.

C. Provide empty telephone service conduits only with pull wire from the building's main telephone terminal to 5'-0" away from building line. Size, number and location of conduit stubs shall be as indicated on the drawings. Intercept existing service conduit already stubbed out under site work, provide all fittings and/or pull boxes and connect complete as required by the telephone company. Coordinate stub outs locations with the Site Contractor. Include all costs in bid.

D. Provide all excavation, backfilling, framing, and other associated Work required for the installation of electrical system.

E. The Contractor shall sign up for house meters and shall provide temporary power for systems testing prior to the completion of the project. The Owner will transfer account upon acceptance of the Work.

F. Provide main switchboards consisting of metering equipment, fused disconnect switches, fuses, branch circuit system with feeders, panels, receptacles, junction boxes, lighting fixtures with lamps (unless noted otherwise). Include circuit breakers, relays, contractors, time switches, fused disconnect switches and time delay fuses for HVAC equipment, conduits and wires for line and low voltage wiring, grounding system as required by code, all hangers, anchors, sleeves, chases, supports, and all other electrical materials and equipment shown or specified. Provide all facilities required by the utility companies.

G. Electrical drawings shall be considered diagrammatic. Sizes and locations of equipment are shown to scale where possible, but may be distorted for clarity. Architectural drawings shall take precedence in representation of general construction work and other drawings take precedence in their respective trades. The Contractor shall refer to all drawings to coordinate electrical work with that of other trades.

H. Maintain throughout the project a complete set of the drawings with all changes clearly recorded. The drawings shall be kept in a clean and neat condition and shall be accessible to the Architect at all times. At the conclusion of the project work with the General Contractor to transfer all notes to a set of Record Documents to be prepared for submission to the Owner.

PART 2 – PRODUCTS

2.01 MANUFACTURERS:

A. Switchgear, Panelboards, wireways, auxiliary gutters: Square D, Federal, G.E., Gould (ITE), FPE, or Challenger.

B. Swing Connectors: Steel City.

C. Conduit: Triangle PWC Inc.

D. Conductors: Crouse-Hinds.

E. Switches, Cover Plates; Sierra.

F. Receptacles, Cover Plates: Sierra, Bryant, Arrow-Hart, Slater.

G. Floor Outlet Boxes: Steel City

H. Safety Switches: Square D, Westinghouse, Gould, G.E., or Challenger.

I. Fusible Switches: Sylvania type “OSF”.

J. Fuses: Bussman

K. Ballasts: Universal, G.E., or Advance.

L. Lamps: Sylvania, G.E., or Westinghouse.

M. Lighting: Halo, Metalux, Marco, Prudential, Prescolite, and Lithonia.

2.02 MATERIALS:

A. Metallic Conduit: Comply with the National Electrical Code and the American Standards Association C80-1-1958 (NEMA-110) and C80-3-1958 (NEMA-112)

1. Rigid Conduit: Threaded steel type, protected by overall zinc coating both inside and outside. Conduit shall be used in concrete slabs on grade or where exposed to weather and/or mechanical damage.
2. Electrical Metallic Tubing: Zinc-coated with baked enamel or plastic finish on inside surfaces. Use in dry concealed locations such as stub partitions or ceiling spaces. Use set screw connectors. Indented fittings shall not be used.
3. Flexible Steel Conduit: Use only for short runs from motors or other vibrating equipment to junction boxes, from recessed lighting fixtures to adjacent junction boxes, and other similar conditions. Use for branch lighting circuitry in accessible ceiling areas only is permissible if accessible by local inspectors. Fittings shall be wedge type. Neoprene jacketed flexible conduit shall be used in locations exposed to weather or dampness, with suitable gland type waterproof fittings having ground continuity jumpers.
4. Non-Metallic Conduit: PVC schedule 40 if allowed by the local authority for all underground runs in lieu of rigid steel, providing that all ells and

bends shall be made with PVC coated rigid steel conduits. Install a green ground conductor in all conduit runs.

B. Conductors: All conductors shall be annealed copper wire only and no aluminum conductors shall be permitted. Provide type "THHN", "TW", "THWN", "AVA" as required. Minimum insulation rating shall be 600 volts.

C. Outlets and Fittings:
1. Outlets in Concealed Work and Lighting Outlets in Exposed Work: Boxes and their covers shall be galvanized or sherardized one-piece pressed steel, knock-out type, and of size and type most suitable for outlet use. All unused openings in boxes shall be closed with factory-made knockout seals.
2. Outlets in Exposed Work, except for Lighting Outlets, and all Fittings Required for Making up Exposed Conduit Run: Shall be cast metal with threaded case hubs integral with the fittings. Provide the size and type most suitable for the outlet use, fitted with the appropriate sheet steel or cast metal covers. All outlets in a humid environment shall be waterproof type.
3. Fixture outlet boxes shall not be less than 4-inch square or octagonal, except outlet boxes in concrete ceilings may be of the 4-inch octagonal concrete type.

D. Large boxes and covers shall be made of code gauge galvanized. A sufficient number of cover screws shall be installed to hold the cover firmly in place along its entire contact surface. Covers shall line up accurately with the edges of surface mounted boxes, and shall extend ¾" beyond the edges of flush mounted boxes. All such surfaces of boxes and covers, inside and out, shall be given a galvanized iron primer and one coat of aluminum paint. Size boxes as indicated on the drawings but in no case less than that indicated in table 370-16 (a) and paragraph 370-2B of the NEC.

E. Weatherproof pull boxes shall conform to the previous paragraph with the following exceptions:
1. The edges of the boxes shall be welded, ground smooth, and rounded, leaving interior fillets.
2. The cover shall be provided with a watertight gasket cemented to and trimmed even with the cover all around.
3. Boxes shall be hot-dipped galvanized after fabrication with galvanized or corrosion resistant screws. All exterior surfaces shall be given two coats of black nitrocellulose lacquer dull finish.

F. Circuit switches shall have ivory handle, specification grade, silent, totally enclosed, bakelite or composition base, toggle type, 20A 120/277 volt, A.C. rated and as follows (No's refer to Sierra Co., color shall selected by the Architect):
1. Single Pole: No. 5021
2. Double Pole: No. 5022

3. Three Way: No. 5023
4. Single switch with pilot light: No. 5027R

G. Convenience Outlets: 15 ampere, 125 volts, 3 wire type, composition base, side wired with binding screws as provided by Sierra #1410, "P" line, Ivory.

H. Faceplates: Sierra, Ivory, Waterproof faceplates: Sierra WP series.

I. Floor outlet boxes: Fully adjustable, Steel City #78 or #98 with screw cover plate.

J. Safety Switches: Provide horsepower rated type HD, externally operated, quick-make and quick-break, and shall be fusible or nonfusible as indicated, and with ratings as shown on the drawings. A maximum voltage, current and horsepower rating shall be clearly marked on the switch enclosure, Switches having dual ratings (higher rating when used with dual element fuses) shall have ratings indicated on metal plate riveted or otherwise permanently fastened to the enclosure.

K. Cabinets: Cabinets for panelboards and terminal boards be flush or surface mounted as shown on the drawings. The Construction shall be of code gauge zinc coated sheet steel bearing the UL inspection label. Cabinet doors shall have flush catches and pin tumbler cylinder locks. Wiring gutters or spaces shall be provided at top, sides, and bottom, having a minimum dimension of 4" at sides, and 6" at top and bottom.

L. Main Switchboard:
1. Main Switchboard shall be 120/208 volt, 3 phase, 4 wire and shall be of the flooring standing metal enclosed, dead front type, each section shall bear the UL label. Arrangement and construction shall be shown on the drawings and described herein. Design, construction, and testing shall comply with code requirements and applicable ASA, AIEE, and NEMA standards. Structural elements of cubicles shall consist of standard rolled shapes or formed sheet steel members, with a minimum thickness of 12 USSG. Construction shall be of bolted or welded type with sufficient mechanical strength to maintain rigidity under shipping, erection. or short circuit stressed. End cubicles shall be provided with blanking plates for future additions. Swichboards shall not exceed 90" in height, including wiring gutters or pull spaces. All steel work shall be sanded, cleaned, rust-proofed, and primed.
2. Switchboard located outdoors shall be installed inside a weatherproof lockable enclosure. Provide sheet metal closures, if required, between switchboard and building wall.
3. Bus bars and connections shall be hard drawn 98 percent conductivity copper. Current densities of busses and connections shall not exceed 1000 amperes per square inch, and copper temperatures shall not exceed code and NEMA requirements. Bus structure and connections shall have sufficient strength to withstand short circuit stresses of the magnitude

shown on the drawings, and shall be free fitted. Connections shall be bolted and silver plated, with corrosion resistant plated nuts and bolts and with constant pressure locking devices. Heavy duty pressure type terminals and cable cleats shall be furnished for outgoing cables. Tin plated aluminum bus bar may be used if fully rated for their application. Painting shall be performed in the factory.

4. Ground and neutral bus with a cross section required by code shall extend through the switchgear, and shall be connected to all current carrying neutrals, the cubicle framework, and non-current carrying parts or apparatus.
5. Metering and current transformer mounting facilities, if required, shall be provided in accordance with utility company requirements.
6. Main disconnect shall be fusible switch, lockable in the "off" position and feeders protection shall be molded case circuit breakers and/or fused disconnect switches as indicated on the drawings.
7. Fusible switches shall be quick-make quick-break ratings as shown on the drawings. When in the "on" position, switch cover shall be interlocked and closed, and in the "off" position, the switch blades shall be visible with the cover opened. Switches shall be horsepower rated through 100 horsepower. Furnish nameplates of black laminated plastic with approximately 1/4" white letters for all main and feeder disconnects and circuit breakers.
8. Fuses shall be furnished and installed for each fusible switch with ampere rating as shown on the drawings. Furnish three spare fuses for each ampere rating used including main switch. Fuses shall be UL Class RKI, current limiting 250 volt, type KTN-R or as otherwise shown on the drawings.
9. Nameplates shall be furnished for each switch or other device, and shall include a large nameplate identifying the switchboard showing voltage and current ratings. Nameplate may be engraved plastic or etched metal. Attach nameplates to equipment with rivets, bolts, or sheet metal screws, cemented attachments will not be accepted. Nameplates for switches shall indicate tenant's address and/or name. Main switchboard shall be equipped with micarta nameplates indicating "CAUTION – USE CURRENT LIMITING FUSES AS ORIGINALLY INSTALLED".
10. All devices shall be series rated.

M. Lighting Panelboards:

1. 120/208 volt panelboards shall be G.E. type "THQB" or approved equal, 3 phase, 4 wire grounded neutral service. Arrangement and location, including the number of circuit breakers, active and inactive spares, bussing and other details, shall be as shown on the drawings and panel schedules, or as required. Neutral bars shall have terminals for all active, spare and inactive circuits. Provide insulated isolated/ground bus for panel serving data terminal system where indicated on the drawings.

2. Circuit breakers shall be of the bolted on molded case quicklag type rated at 250 volts or 600 volts and shall have an interrupting capacity of 10,000 RMS amperes symmetrical unless otherwise shown on the drawings. Plug circuit breakers are not permitted.
3. Circuit breakers shall be single pole or multi pole common handle and trip, with trip setting shown on the drawings or panel schedules. Blocking clips on circuit breakers serving lighting circuits without local switching. Provide circuit breakers handle lock-on devices where indicated.
4. Cabinet construction shall be in accordance with the article entitled CABINETS. Cabinets and components shall posses sufficient mechanical strength and rigidity to safely withstand stresses imposed by shipping, erection, or short circuits.
5. Sizes: Minimum 20” wide and 5-3/4” deep flush type unless otherwise indicated. Top and bottom gutter minimum 6” high. Provide 12” gutter where double lugs are required or where cable size exceeds bus size.
6. Bus Bars: Copper with silver plated joints and connections or tinplated aluminum. Provide split bus bars where indicated. Neutral bus shall be electrically isolated from enclosure. Spaces as called for shall have bus bars drilled and tagged ready to receive breakers.
7. Ground Bus: Where ground conductors are installed or required, provide a separate equipment ground bus in panel electrically connected to enclosure.
8. All devices shall be series rated.

N. Lighting Fixtures:
1. Fixture types shall be shown on the drawings and as further described in these specifications.
2. Fixtures shall have all parts and fittings necessary to completely and properly install the fixture. All fixtures shall be wired from outlet to socket with #14 AWG Underwriters’ type “AF” or “CF” fixture wire. All fixtures shall be equipped with lamps of the size and type specified. All 300 watt fixtures shall have mogul sockets or as specified otherwise.
3. Ballasts for fluorescent fixtures shall be of the high power factor type, shall have sound rating of “A”, and shall be “P” rated. Ballasts shall be of two lamp style, if practicable. Three lamp ballasts shall not be used. Noisy ballasts, including radio or other interferences, shall be promptly replaced upon notice by the Owner during the warranty period. Ballasts shall bear the CBM, UL, and ETL labels certifying the ballasts comply with CBM specifications and standards. Ballasts shall be guaranteed for two years.
4. Incandescent lamps shall be rated at 120 volts and shall be general purpose inside frosted type, except as otherwise stated herein or shown on the drawings. Lamps rated 300 watts or above shall be described under individual fixture descriptions on the drawings.
5. Lamps shall be the type indicated on the Light Fixture Schedule in the Drawings.
6. Install motion sensors as indicated on the Drawings.

O. Telephone System: Telephone outlets in solid walls be 4 11/16" square, at least 2 1/8" deep with single gang 1 ¼" deep plaster ring. Outlets in hollow walls shall be single gang plaster ring; strap conduit adjacent to outlet and terminate with bushing.

PART 3 – EXECUTION

3.01 GENERAL:

A. Accessibility and Clearance: Electrical equipment, outlets, junction and pullboxes, shall be installed in accessible locations, avoiding obstructions, preserving headroom, and keeping openings and passageways clear. Minor adjustments in the locations of equipment shall be made where necessary, providing such adjustments do not adversely affect functioning of the equipment.

B. Structural Fittings: Furnish and install the necessary sleeves, inserts, hangers, anchor bolts, and related structural items. Install at proper time.

C. Identification of Circuits and Equipment.
1. Main switchboards, panelboards, circuit breakers, disconnect switches, starters, pushbutton control stations, and other apparatus used for the operation or control of feeder circuits, appliances, air conditioning units, or equipment shall be properly identified by means of descriptive nameplates, permanently attached to equipment.
2. Nameplates shall be engraved laminated phenolic with white letters on black background. Attachment to equipment shall be with escutcheon pins or rivets. Self-adhering or adhesive backed nameplates shall not be used.
3. Cardholders and cards shall be provided for circuit identification in panel boards. Cardholders shall consist of a metal frame retaining a clear plastic cover permanently attached to the inside of panel door. List of circuits shall be typewritten on card. Circuit description shall include name of area and/or connected load.
4. Junction and pull boxes shall have covers stenciled with box number when shown on the drawings, or circuit numbers according to panel schedules. Data shall be lettered in an inconspicuous manner with a color contrasting to finish.

3.02 GROUNDING AND BONDING:

A. Provide a complete grounding and bonding installation in accordance with all requirements of applicable codes, ordinances and the serving utility companies, whether or not indicated. Provide "UFER" grounding system.

B. Ground resistance shall not be greater than code requirements, and supplementary grounding facilities shall be provided, if required to maintain minimum resistance value as required by the local electrical inspector.

C. Where non-metallic conduits are used, provide green insulated ground conductor of code size within the conduits and terminate properly to equipment enclosures at each end. Increase conduit, fittings and pull box sizes as required to accommodate the additional conductor. Use separate ground bus bars in all switchboards, distribution boards, and panelboards, where indicated.

D. Connection from the ground to equipment shall be made in permanently accessible locations by approved types of bolted or clamped solderless connectors with stranded copper conductors. Soldered connections or lugs shall not be used.

E. Provide bonding devices, fittings or jumpers at expansion fittings or where ever continuity or grounding is not certain or where required by inspecting authorities.

3.03 CONDUIT INSTALLATION:

A. Provide all necessary sleeves, and chases where conduits pass through floors, walls, and any other necessary openings and spaces, all of which shall be arranged for in proper time to prevent unnecessary cutting. Do all cutting that may become necessary in connection with the Work and make all repairs in a manner satisfactory to the Architect.

B. Exposed conduit shall run parallel to or at right angles with the lines of the building. Bends shall be made with standard conduit elbows or conduit bends, not less than the same radius. All bends shall be free from dents or flattening. Exposed conduit shall be kept to an absolute minimum with none in finished areas.

C. Flexible conduit shall be installed so that no sharp edges are present to cut conductor insulation and of sufficient length to permit required movement of device connected. Provide equipment grounding conductor within flexible conduit where length is more than six feet or where used for wiring or branch circuits having current protection devices rated over 20 amperes.

D. Conduits shall be securely and rigidly supported and fastened in place with supports. Exposed conduit along wood members shall be secured in place with approved one or two hole pipe straps and affixed by wood screws.

E. Double wrap or apply two coats of bitumastic compound on all steel conduits in contact with earth or concrete.

F. In demountable ceiling areas install conduits above ceiling panels so that in no case will ceiling tile removal or installation be hindered.

G. Conduit elbows in service runs for power and telephone services shall be long radius bends.

H. Provide a 12-AWG zinc coated iron pull wire or a 1/8" nylon cord in all empty conduits. Tag all empty conduits and conduit stubs at all exposed ends with tags marked with the size, length of run, and the location of other termination.

I. Conduits shall pass either above or below footings, unless approval has been received from the structural engineer. Conduits shall not be embedded in a concrete slab when the outside diameter of the conduit is greater than one-third the thickness of the slab, except for offsets at outlets. Consult with the structural Engineer prior to installing conduit in concrete slabs. Conduit shall not be imbedded in structural concrete or structural masonry unless approved by the Architect. Conduits passing through or entering concrete vaults and where installed must have at least 2-90 degree bends and be sloped to drain out or away from vault.

J. Provide a Semco No. 1100-4 four-pound seamless lead flashing assembly with 8" skirt or equal on each pipe passing through the roof. Flashing shall have steel reinforced boot and be complete with caulk type sealing cast iron counter flashing sleeve and waterproof sealing compound.

K. Sleeves through walls below grade shall be caulked tight with Oakum and with ends sealed with an approved semi-plastic coal tar base compound, or shall be of the stuffing-box type. Other sleeves shall be packed with glass wool and ends sealed with Dux-seal. Conduits passing through floors slabs at grade level will not require sleeves and shall be placed with tops of couplings at floor level.

3.04 CONDUCTOR INSTALLATION:

A. Conductors shall be delivered to the site in their original unbroken packages plainly marked or tagged with: Underwriters' labels, size and kind of both insulation of wire and voltages, name of manufacturing company with trade name of the wire, and month and year when manufactured (date shall not exceed months prior to delivery date at job site). All feeders shall be type "THW". Type "THHN" insulation may be used where more advantageous in dry locations.

B. Control circuits for mechanical equipment in locations subject to abnormal temperatures on or under furnaces and heaters shall be type "AVA" 600-volt insulation conductors. Increase conduit size to provide for the larger diameter conductors.

C. Conductors installed within fluorescent fixture raceways shall be 600 volt type "THW" or as approved by local authority.

D. Minimum wire size shall be #12 AWG unless specifically noted as #14. Wires larger than #8 shall be type "THW" and smaller then #8 shall be "TW" unless otherwise noted. Conductors larger than #8 shall be stranded.

E. All branch circuits wiring shall be color coded as required by local authority and shall be continuous from outlet to outlet, pull box or cabinet.

F. Conduits shall be blown-out and thoroughly cleaned before conductors are drawn in. No wires or cables shall be installed until construction work which might damage insulation has been completed. Mechanical means of pulling shall not be used unless approved. No lubricants other than powered soapstone or minerallac pull-in compound may be used.

G. Conductors in panels, switchgear, terminal cabinets, pull boxes, and wiring gutters shall be neatly grouped and formed in a manner to fan into terminals with regular spacing. Formed groups of conductors shall be laced and tied.

3.05 OUTLETS:

A. All boxes shall be installed in a rigid and satisfactory manner and shall not be supported to hanger wires above suspended ceiling.

B. Outlets shall be generally installed in the locations shown. Refer to the Architectural floor and other plans for relationships to spaces surrounding each outlet so that it may fit with other Work required. Relocate outlets as that when fixtures or other furnishings and equipment are installed, outlets will be symmetrically located according to the room layout and will not interfere with other Work or equipment.

C. Outlets in concrete ceilings shall be set flush with the finished surface. Fixture outlet boxes in plastered ceilings shall be fitted with open covers finished flush with the surrounding finished surface.

D. Unless otherwise specified or noted on the drawing, boxes for the various outlets shall be as follows:
   1. Light outlet boxes shall be equipped with plaster rings, fixture supporting device, spacers as required by the unit to be installed, and fixture studs.
   2. For wall switch outlets, use 4-inch boxes with single or two gauge boxes with gang plaster rings for more than two switches, unless otherwise noted on drawings.
   3. For convenience outlets, use 4-inch square boxes with single gang box covers.
   4. For outlet boxes in exposed work for lighting outlets, devices and junction boxes, use Crouse-Hinds Condulets of the size and type required for each use.
   5. Covers and device plates for such boxes shall be rolled edge type.
   6. Outlet boxes shall be minimum 4-inch for electrical and minimum 5-inch for telephone.
   7. Boxes containing devices shall be a minimum of 2 ¼” deep.

3.06 JUNCTION AND PULL BOXES:

A. Junction and pull boxes shall be installed where required for pulling or tapping conductors.

B. Outlet boxes shall be used for junction and pull boxes whenever possible. Outlets in concealed work shall be finished with a blank wall plate. Those in exposed work shall be fitted with blank sheet steel or cast metal covers.

3.07 INSTALLATION AND SUPPORT OF OUTLETS:

A. Outlet boxes shall be plumbed, securely fastened to the structure and shall not depend on the conduits for support and shall be accurately placed so as to finish flush with the finished surface. Factory made steel bar hangers shall be used to support outlet boxes not fastened directly to masonry or other solid backing. Hangers for fluorescent fixtures shall be 150 pound rated.

B. Heights of outlets and equipment shown on the drawings shall govern, but in the absence of such indication, the following centerline heights above the finished floor shall be maintained.
   1. Wall switches: +42” maximum
   2. Convenience outlets: +15”.
   3. Telephone outlets: +15”.
   4. Television outlets: +15”.

3.08 WIREWAYS AND AUXILIARY GUTTERS:

A. Where indicated, or as a substitute for conduit where approved, provide hinged-cover type wireways designed to permit lay-in installation of conductors. Support wireways at legal intervals and at each change in direction of elevation using manufacturer’s standard fittings. Where not attached directly to the building structure, use ½” galvanized steel rods with swing connectors. Use factory fabricated flanges to connect wireways to switchboards and panel boards. Install wireways for top or side access unless indicated or required to be otherwise.

B. Where indicated, or where required to consolidate wiring or to supplement wiring spaces at equipment provide screw-cover type auxiliary gutters sized as required to accommodate the associated equipment and conductors.

C. Wireways and auxiliary gutters shall be provided with all parts for a complete installation. Ensure continuity of equipment and enclosures grounding at all raceway connections.

3.09 CIRCUIT SWITCHES, RECEPTACLES, AND FINISH MATERIALS:

A. Where more than one switch is shown at one outlet, a gang box shall be used and switches shall be installed under one plate on a common plaster ring in order appropriate to the location of the outlets controlled.

B. All weatherproof outlets concealed shall be equipped with rubber gaskets and weatherproof condulets covers and all weatherproof outlets exposed shall be weatherproof condulets with hubs as required and equipped with rubber gaskets and weatherproof condulet covers.

C. Plates shall be supplied for every local switch, receptacle, junction box, telephone outlet, etc. All plates shall be furnished with engraved or etched designations under any one of the following conditions: Three gang or larger gang switches, Lock switches, Pilot switches, Switches in locations from which the equipment or circuits controlled cannot be readily seen, where so indicated on the drawings, and where receptacles are other than standard duplex receptacles.

D. Convenience outlets shall consist of a duplex receptacle mounted in an outlet box in the wall, flush with finished plaster or surface. All outlets shown outdoors shall be weatherproof.

E. Floor outlet boxes: Provide C.I. floor boxes where required by code. Provide floorplate assembly to fit floor installed and duplex receptacle outlets where indicated on drawings.

3.10 PANELBOARDS:

A. Cabinets shall be flush or surface mounted as shown on the drawings. Identification nameplates and cardholders shall be provided in accordance with the article entitled IDENTIFICATION OR CIRCUIT AND EQUIPMENT.

B. All panelboard locks shall be keyed alike, and two keys shall be furnished with each lock.

C. Provide neatly typed index cards, clearly and correctly identifying all circuits, mounted in metal frame cardholders behind heavy plastic on the inside of the panelboard door. Indexes shall accurately record all room names as designated by the Architect.

3.11 LIGHTING FIXTURES:

A. Recessed fixtures where noted or required to have attached pull box shall have a 4” pull box permanently attached to the plaster ring so that it is accessible when the fixture is removed. The fixture shall bear UL approval for wattage indicated.

B. Ceiling mounted fluorescent fixtures shall have minimum of two supports per fixture, one near each end fastened directly to structural member and shall be grounded by conduit connection to fixture.

C. All backing for fixtures shall be provided. All ceiling mounted fluorescent fixtures shall be equipped with two 1 ½" spacers per fixture where installed on combustible ceiling surface, except those fixtures designed and approved for direct mounting to combustible ceilings. Continuous row fixtures shall be jointed by the use of chase nipples or fittings approved for the use. All lighting fixture shall be set true to line and spacing.

D. Lamps shall be furnished and installed in all lighting fixtures in accordance with characteristics, type, and wattage given under each fixture description. The Contractor is required to replace all burned out lamps during construction and up to the date of final acceptance of project by the Owner.

3.12 EXTERIOR SIGN: Provide circuits and outlets for all exterior building signs. Verify exact number of outlets required and their locations with sign installer.

3.13 HEATING, VENTILATING AND AIR CONDITIONING: For HVAC, furnish and install all line and low voltage conduits and wiring, outlets, disconnect switches, and time switching required for the specific operation of the equipment. Connect all motors and control equipment. All wiring shall be installed in conduits. All control wiring shall conform to the wiring diagrams shown on the Heating and Ventilating Drawings and the Manufacturer's wiring diagrams, and shall control equipment in the manner specified under other sections of the Specifications.

3.14 TELEPHONE SYSTEM:

A. Provide building main telephone terminals, double duplex receptacle and grounding and 3/4" plywood backboard as indicated on drawings. Install 3/4" C-1 #6 THW copper from telephone backboard to nearest cold water pipe in an accessible location. Connect also to "UFER" ground as indicated on drawings and/or required by the telephone company. Building telephone terminals, when located outdoors, shall be installed inside weatherproof lockable enclosures with 120V duplex receptacle outlets and 3/4" plywood backboards and shall be per telephone company requirements.

B. Provide telephone service conduit with telephone outlet and cover plate to each tenant space or as shown on the drawings. Provide all conduits with #12 G.I. pull wire, junction and/or pull boxes and electrical facilities as required by telephone company and telephone system supplier in tenant spaces.

C. Telephone conduit shall be 1" minimum size unless otherwise noted on the drawings. Where conduit enters the building, keep conduit free of contact with reinforcing steel and other metallic structures or pipes.

3.15 TESTS: All wiring and connections shall be tested for continuity, short circuits, and proper or improper grounds. Each lighting panel shall be tested with mains disconnected

from the feeders, branches connected, wall switches closed, fixtures permanently connected and without lamps.

3.16 CLEANING AND PROTECTION: Protect newly installed equipment until completion of project. Clean, test, and adjust as required for proper performance. Finished surfaces shall be restored to their original texture and finish. Lighting fixtures shall be cleaned, metal and glass work polished, and lamps wiped clean.

END OF SECTION

(PAGE INTENTIONALLY LEFT BLANK)

SECTION 26 05 19 - LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Building wires and cables rated 600 V and less.
2. Connectors, splices, and terminations rated 600 V and less.
3. Sleeves and sleeve seals for cables.

1.2 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Field quality-control test reports.

1.3 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

B. Comply with NFPA 70.

PART 2 - PRODUCTS

2.1 CONDUCTORS AND CABLES

A. Conductors: Comply with NEMA WC 70.

B. Conductor Insulation: Comply with NEMA WC 70 for Types THW, THHN-THWN and SO.

C. Multi-conductor Cable: Comply with NEMA WC 70 with ground wire.

2.2 CONNECTORS AND SPLICES

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. AFC Cable Systems, Inc.
2. Hubbell Power Systems, Inc.
3. O-Z/Gedney; EGS Electrical Group LLC.
4. 3M; Electrical Products Division.
5. Tyco Electronics Corp.

C. Description: Factory-fabricated connectors and splices of size, ampacity rating, material, type, and class for application and service indicated.

2.3 SLEEVES FOR CABLES

A. Steel Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, galvanized steel, plain ends.

B. Cast-Iron Pipe Sleeves: Cast or fabricated "wall pipe," equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop, unless otherwise indicated.

C. Coordinate sleeve selection and application with selection and application of firestopping specified in Division 07 Section "Penetration Firestopping."

2.4 SLEEVE SEALS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

C. Basis-of-Design Product: Subject to compliance with requirements, provide the product indicated on Drawings or a comparable product by one of the following:

1. Advance Products & Systems, Inc.
2. Calpico, Inc.
3. Metraflex Co.
4. Pipeline Seal and Insulator, Inc.

D. Description: Modular sealing device, designed for field assembly, to fill annular space between sleeve and cable.

1. Sealing Elements: EPDM or NBR interlocking links shaped to fit surface of cable or conduit. Include type and number required for material and size of raceway or cable.
2. Pressure Plates: Plastic or Carbon steel. Include two for each sealing element.
3. Connecting Bolts and Nuts: Carbon steel with corrosion-resistant coating of length required to secure pressure plates to sealing elements. Include one for each sealing element.

PART 3 - EXECUTION

3.1 CONDUCTOR MATERIAL APPLICATIONS

A. Feeders: Copper. Solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.

B. Branch Circuits: Copper. Solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.

3.2 CONDUCTOR INSULATION AND MULTICONDUCTOR CABLE APPLICATIONS AND WIRING METHODS

A. Service Entrance: Type THHN-THWN, single conductors in raceway.

B. Exposed Feeders: Type THHN-THWN, single conductors in raceway.

C. Feeders Concealed in Ceilings, Walls, Partitions, and Crawlspaces: Type THHN-THWN, single conductors in raceway.

D. Feeders Concealed in Concrete, below Slabs-on-Grade, and Underground: Type THHN-THWN, single conductors in raceway.

E. Exposed Branch Circuits, Including in Crawlspaces: Type THHN-THWN, single conductors in raceway.

F. Branch Circuits Concealed in Ceilings, Walls, and Partitions: Type THHN-THWN, single conductors in raceway.

G. Branch Circuits Concealed in Concrete, below Slabs-on-Grade, and Underground: Type THHN-THWN, single conductors in raceway.

H. Cord Drops and Portable Appliance Connections: Type SO, hard service cord with stainless-steel, wire-mesh, strain relief device at terminations to suit application.

I. Class 1 Control Circuits: Type THHN-THWN, in raceway.

J. Class 2 Control Circuits: Type THHN-THWN, in raceway, Power-limited cable, concealed in building finishes, Power-limited tray cable, in cable tray.

3.3 INSTALLATION OF CONDUCTORS AND CABLES

A. Conceal cables in finished walls, ceilings, and floors, unless otherwise indicated.

B. Use manufacturer-approved pulling compound or lubricant where necessary; compound used must not deteriorate conductor or insulation. Do not exceed manufacturer's recommended maximum pulling tensions and sidewall pressure values.

C. Use pulling means, including fish tape, cable, rope, and basket-weave wire/cable grips, that will not damage cables or raceway.

D. Install exposed cables parallel and perpendicular to surfaces of exposed structural members, and follow surface contours where possible.

E. Support cables according to Electrical Section 26 00 00 and Electrical Section 26 05 36 “Cable Tray for Electrical Systems”.

F. Identify and color-code conductors and cables according to Electrical Section 26 00 00.

G. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

H. Make splices and taps that are compatible with conductor material and that possess equivalent or better mechanical strength and insulation ratings than unspliced conductors.

1. Use oxide inhibitor in each splice and tap conductor for aluminum conductors.

I. Wiring at Outlets: Install conductor at each outlet, with at least 6 inches (150 mm) of slack.

3.4 SLEEVE INSTALLATION FOR ELECTRICAL PENETRATIONS

A. Coordinate sleeve selection and application with selection and application of firestopping specified in Division 07 Section "Penetration Firestopping."

B. Concrete Slabs and Walls: Install sleeves for penetrations unless core-drilled holes or formed openings are used. Install sleeves during erection of slabs and walls.

C. Fire-Rated Assemblies: Install sleeves for penetrations of fire-rated floor and wall assemblies unless openings compatible with firestop system used are fabricated during construction of floor or wall.

D. Cut sleeves to length for mounting flush with both wall surfaces.

E. Extend sleeves installed in floors 2 inches (50 mm) above finished floor level.

F. Size pipe sleeves to provide 1/4-inch (6.4-mm) annular clear space between sleeve and cable unless sleeve seal is to be installed or unless seismic criteria require different clearance.

G. Seal space outside of sleeves with grout for penetrations of concrete and masonry and with approved joint compound for gypsum board assemblies.

H. Interior Penetrations of Non-Fire-Rated Walls and Floors: Seal annular space between sleeve and cable, using joint sealant appropriate for size, depth, and location of joint according to Division 07 Section "Joint Sealants."

I. Fire-Rated-Assembly Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at cable penetrations. Install sleeves and seal with firestop materials according to Division 07 Section "Firestopping."

J. Roof-Penetration Sleeves: Seal penetration of individual cables with flexible boot-type flashing units applied in coordination with roofing work.

K. Aboveground Exterior-Wall Penetrations: Seal penetrations using sleeves and mechanical sleeve seals. Size sleeves to allow for 1-inch (25-mm) annular clear space between pipe and sleeve for installing mechanical sleeve seals.

L. Underground Exterior-Wall Penetrations: Install cast-iron "wall pipes" for sleeves. Size sleeves to allow for 1-inch (25-mm) annular clear space between cable and sleeve for installing mechanical sleeve seals.

3.5 SLEEVE-SEAL INSTALLATION

A. Install to seal underground exterior-wall penetrations.

B. Use type and number of sealing elements recommended by manufacturer for cable material and size. Position cable in center of sleeve. Assemble mechanical sleeve seals and install in annular space between cable and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

3.6 FIRESTOPPING

A. Apply firestopping to electrical penetrations of fire-rated floor and wall assemblies to restore original fire-resistance rating of assembly according to Division 07 Section "Firestopping."

3.7 FIELD QUALITY CONTROL

A. Perform tests and inspections and prepare test reports.

B. Tests and Inspections:

1. After installing conductors and cables and before electrical circuitry has been energized, test service entrance and feeder conductors, and conductors feeding critical equipment and services for compliance with requirements.

2. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.
3. Infrared Scanning: After Substantial Completion, but not more than 60 days after Final Acceptance, perform an infrared scan of each splice in cables and conductors No. 3 AWG and larger. Remove box and equipment covers so splices are accessible to portable scanner.

    a. Follow-up Infrared Scanning: Perform an additional follow-up infrared scan of each splice 11 months after date of Substantial Completion.
    b. Instrument: Use an infrared scanning device designed to measure temperature or to detect significant deviations from normal values. Provide calibration record for device.
    c. Record of Infrared Scanning: Prepare a certified report that identifies splices checked and that describes scanning results. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.

C. Test Reports: Prepare a written report to record the following:

1. Test procedures used.
2. Test results that comply with requirements.
3. Test results that do not comply with requirements and corrective action taken to achieve compliance with requirements.

D. Remove and replace malfunctioning units and retest as specified above.

END OF SECTION 26 05 19

SECTION 26 05 36 - CABLE TRAYS FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes steel and aluminum cable trays and accessories.

1.2 SUBMITTALS

A. Product Data: Include data indicating dimensions and finishes for each type of cable tray indicated.

B. Shop Drawings: Show fabrication and installation details of cable trays, including plans, elevations, and sections of components and attachments to other construction elements. Designate components and accessories, including clamps, brackets, hanger rods, splice-plate connectors, expansion-joint assemblies, straight lengths, and fittings.

1. Seismic-Restraint Details: Signed and sealed by a qualified professional engineer, licensed in the state where Project is located, who is responsible for their preparation.

a. Design Calculations: Calculate requirements for selecting seismic restraints.
b. Detail fabrication, including anchorages and attachments to structure and to supported cable trays.

C. Field quality-control reports.

D. Operation and maintenance data.

1.3 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

B. Comply with NFPA 70.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. Chalfant Manufacturing Company.
   2. Cooper B-Line, Inc.
   3. Cope, T. J., Inc.; a subsidiary of Allied Tube & Conduit.
   4. GS Metals Corp.; GLOBETRAY Products.
   5. MONO-SYSTEMS, Inc.
   6. MPHusky.
   7. PW Industries.

2.2 MATERIALS AND FINISHES

A. Cable Trays, Fittings, and Accessories: Steel, complying with NEMA VE 1.

   1. Factory-standard primer, ready for field painting; with cadmium-plated hardware according to ASTM B 766.
   2. Mill galvanized before fabrication, complying with ASTM A 653/A 653M, G90 (Z275) coating; with hardware galvanized according to ASTM B 633.
   3. Electrogalvanized before fabrication, complying with ASTM B 633; with hardware galvanized according to ASTM B 633.
   4. Hot-dip galvanized after fabrication, complying with ASTM A 123/A 123M, Class B2; with chromium-zinc, ASTM F 1136 hardware.
   5. Epoxy-resin paint over paint manufacturer's recommended primer and corrosion-inhibiting treatment; with cadmium-plated hardware according to ASTM B 766.

B. Cable Trays, Fittings, and Accessories: Aluminum, complying with NEMA VE 1, Aluminum Association's Alloy 6063-T6 for rails, rungs, and cable trays, and Alloy 5052-H32 or Alloy 6061-T6 for fabricated parts; with chromium-zinc, ASTM F 1136 splice-plate fasteners, bolts, and screws.

C. Sizes and Configurations: Refer to the Cable Tray Schedule on Drawings for specific requirements for types, materials, sizes, and configurations.

   1. Center-hanger supports may be used only when specifically indicated.

2.3 CABLE TRAY ACCESSORIES

A. Fittings: Tees, crosses, risers, elbows, and other fittings as indicated, of same materials and finishes as cable tray.

B. Covers: Louvered or Ventilated-hat type of same materials and finishes as cable tray.

C. Barrier Strips: Same materials and finishes as cable tray.

D. Cable tray supports and connectors, including bonding jumpers, as recommended by cable tray manufacturer.

2.4 WARNING SIGNS

A. Lettering: 1-1/2-inch- (40-mm-) high, black letters on yellow background with legend "WARNING! NOT TO BE USED AS WALKWAY, LADDER, OR SUPPORT FOR LADDERS OR PERSONNEL."

B. Materials and fastening are specified in Division 26 Section "Identification for Electrical Systems."

PART 3 - EXECUTION

3.1 INSTALLATION

A. Comply with recommendations in NEMA VE 2. Install as a complete system, including all necessary fasteners, hold-down clips, splice-plate support systems, barrier strips, hinged horizontal and vertical splice plates, elbows, reducers, tees, and crosses.

B. Remove burrs and sharp edges from cable trays.

C. Fasten cable tray supports to building structure and install seismic restraints.

1. Design each fastener and support to carry load indicated by seismic requirements and to comply with seismic-restraint requirements.
2. Place supports so that spans do not exceed maximum spans on schedules.
3. Construct supports from channel members, threaded rods, and other appurtenances furnished by cable tray manufacturer. Arrange supports in trapeze or wall-bracket form as required by application.
4. Support bus assembly to prevent twisting from eccentric loading.
5. Manufacture center-hung support, designed for 60 percent versus 40 percent eccentric loading condition, with a safety factor of 3.
6. Locate and install supports according to NEMA FG 1 and NEMA VE 1.

D. Make connections to equipment with flanged fittings fastened to cable tray and to equipment. Support cable tray independent of fittings. Do not carry weight of cable tray on equipment enclosure.

E. Install expansion connectors where cable tray crosses building expansion joint and in cable tray runs that exceed dimensions recommended in NEMA FG 1 and NEMA VE 1. Space connectors and set gaps according to applicable standard.

F. Make changes in direction and elevation using standard fittings.

G. Make cable tray connections using standard fittings.

H. Seal penetrations through fire and smoke barriers according to Division 07 Section "Penetration Firestopping."

I. Sleeves for Future Cables: Install capped sleeves for future cables through firestop-sealed cable tray penetrations of fire and smoke barriers.

J. Workspace: Install cable trays with enough space to permit access for installing cables.

K. Install barriers to separate cables of different systems, such as power, communications, and data processing; or of different insulation levels, such as 600, 5000, and 15 000 V.

L. After installation of cable trays is completed, install warning signs in visible locations on or near cable trays.

M. Install cables only when cable tray installation has been completed and inspected.

N. Fasten cables on horizontal runs with cable clamps or cable ties as recommended by NEMA VE 2. Tighten clamps only enough to secure the cable, without indenting the cable jacket. Install cable ties with a tool that includes an automatic pressure-limiting device.

O. On vertical runs, fasten cables to tray every 18 inches (457 mm). Install intermediate supports when cable weight exceeds the load-carrying capacity of the tray rungs.

P. In existing construction, remove inactive or dead cables from cable tray.

Q. Install covers after installation of cable is completed.

R. Ground cable trays according to manufacturer's written instructions.

S. Install an insulated equipment grounding conductor with cable tray, in addition to those required by NFPA 70.

3.2 FIELD QUALITY CONTROL

A. After installing cable trays and after electrical circuitry has been energized, survey for compliance with requirements. Perform the following field quality-control survey:

1. Visually inspect cable insulation for damage. Correct sharp corners, protuberances in cable tray, vibration, and thermal expansion and contraction conditions, which may cause or have caused damage.
2. Verify that the number, size, and voltage of cables in cable tray do not exceed that permitted by NFPA 70. Verify that communication or data-processing circuits are separated from power circuits by barriers.
3. Verify that there is no intrusion of such items as pipe, hangers, or other equipment that could damage cables.
4. Remove deposits of dust, industrial process materials, trash of any description, and any blockage of tray ventilation.
5. Visually inspect each cable tray joint and each ground connection for mechanical continuity. Check bolted connections between sections for corrosion. Clean and retorque in suspect areas.
6. Check for missing or damaged bolts, bolt heads, or nuts. When found, replace with specified hardware.
7. Perform visual and mechanical checks for adequacy of cable tray grounding; verify that all takeoff raceways are bonded to cable tray.

B. Report results in writing.

END OF SECTION 26 05 36

(PAGE INTENTIONALLY LEFT BLANK)

SECTION 26 32 13 – ENGINE GENERATOR

PART 1 – GENERAL

1.1 SUMMARY

A This section includes the following items from a single supplier:
1. Engine Generator Set.
2. Enclosure
3. Related Accessories as specified

B Products Furnished or Supplied but not installed

C Products Installed but not furnished or supplied

D Related Requirements
1. It is the intent of this specification to secure an engine-driven generator set that has been prototype tested, factory built, production-tested, and site-tested together with all accessories necessary for a complete installation as shown on the plans and drawings and specified herein.
2. Any exceptions to the published specifications shall be subject to the approval of the engineer and submitted minimum 10 days prior to the closing of the bid with a line by line summary description of all the items of compliance, any items that have been are omitted or have been taken exception to, and a complete description of all deviations.
3. It is the intent of this specification to secure a generator set system that has been tested during design verification, in production, and at the final job site. The generator set will be a commercial design and will be complete with all of the necessary accessories for complete installation as shown on the plans, drawings, and specifications herein. The equipment supplied shall meet the requirements of the National Electrical Code and applicable local codes and regulations.
4. All equipment shall be new and of current production by an international, power system manufacturer of generators, transfer switches, and paralleling switchgear. The manufacturer shall be a supplier of a complete and coordinated system. There will be single-source responsibility for warranty, parts, and service through a factory-authorized representative with factory-trained technicians.

1.2 PRICE AND PAYMENT PROCEDURES

A Allowances

B Unit Prices

C Alternates or Alternatives

D Measurement and Payment

1.3 REFERENCES

A Abbreviations and Acronyms

B Definitions

C Reference Standards

1.4 ADMINISTRATIVE REQUIREMENTS

A Coordination
B Pre-installation Meeting
C Sequencing
D Scheduling

1.5 SUBMITTALS

A Action Submittals
1. Product Data
a The submittal shall include prototype test certification and specification sheets showing all standard and optional accessories to be supplied; schematic wiring diagrams, dimension drawings, and interconnection diagrams identifying by terminal number each required interconnection between the generator set, the transfer switch, and the remote annunciator panel if it is included elsewhere in these specifications.
2. Shop Drawings
3. Samples

B Informational Submittal
1. Certificates
a The generator set shall be listed to UL 2200 or submitted to an independent third party certification process to verify compliance as installed.
b The generator set shall be IBC Certified as meeting the required maximum seismic design acceleration level per the International Building Code 2000/2003 or 2006 for the specific job site. The generator shall be analyzed or shake tested by a third party, accompanied by a Certificate of Compliance, and include a seismic label on the generator set (per Section 1702 of the IBC Code). Seismic certified generators shall be installed per the specific seismic instructions provided by the manufacturer.
2. Test and Evaluation Reports
3. Manufacturer's Instruction
4. Source Quality Control Submittals
5. Field or Site Quality Control
6. Manufacturer's Report
7. Special Procedure Submittal
8. Qualification Statement

C Closeout Submittal
1. Maintenance Contracts
2. Operation And Maintenance Data
3. Bonds
4. Warranty Documentation
5. Record Documentation
6. Software

D Maintenance Material Submittals
1. Provide one (1) copy of the following documents and manuals for the engine, the alternator, and the generator set:
a) Operation Manuals
b) Parts Catalogs
c) Wiring Diagrams.

1.6 Quality Assurance

A Regulatory Agency

1. The generator set shall conform to the requirements of the following codes and standards:
   a CSA C22.2, No. 14-M91 Industrial Control Equipment.
   b EN50082-2, Electromagnetic Compatibility-Generic Immunity Requirements, Part 2: Industrial.
   c EN55011, Limits and Methods of Measurement of Radio Interference Characteristics of Industrial, Scientific and Medical Equipment.
   d IEC8528 part 4, Control Systems for Generator Sets.
   e IEC Std 61000-2 and 61000-3 for susceptibility, 61000-6 radiated and conducted electromagnetic emissions.
   f IEEE446 Recommended Practice for Emergency and Standby Power Systems for Commercial and Industrial Applications.
   g NFPA 70, National Electrical Code, Equipment shall be suitable for use in systems in compliance to Article 700, 701, and 702.
   h NFPA 99, Essential Electrical Systems for Health Care Facilities.
   i NFPA 110, Emergency and Standby Power Systems. The generator set shall meet all requirements for Level 1 systems. Level 1 prototype tests required by this standard shall have been performed on a complete and functional unit. Component level type tests will not substitute for this requirement.
2. Qualifications
   a The equipment shall be produced by a manufacturer who is ISO 9001 certified for the design, development, production and service of its complete product line.
   b The power system shall be produced by a manufacturer who has produced this type of equipment for a period of at least 10 years and who maintains a service organization available twenty-four hours a day throughout the year.
3. Manufacturers
   a The power system shall be furnished by a single manufacturer who shall be responsible for the design, coordination, and testing of the complete system. The entire system shall be installed as shown on the plans, drawings, and specifications herein.
4. Suppliers
5. Fabricators
6. Installers/ Applicators/ Erectors
7. Testing Agencies
8. Licensed Professional
9. Certificates
10. Preconstruction testing
11. Field and Site Samples
12. Mock-ups

1.7 Delivery, Storage, and Handling

A Delivery and Acceptance Requirements
B Storage and Handling Requirements
C Packaging Waste Management

1.8 Field or Site Conditions

A Ambient Conditions
1. Engine- generator set shall operate in the following conditions without any damage to the unit or its loads.
a Ambient Temperature: 77 °F
b Altitude : 500 ft
c Relative Humidity: 95%

B Existing Conditions

1.9 Warranty or Bond

A Manufacturer's Warranty
1. The generator set shall include a standard warranty covering five (5) years or 3000 hours, whichever occurs first, to guarantee against defective material and workmanship in accordance with the manufacturer's published warranty from the date of initial startup.
2. The generator set manufacturer and its distributor shall maintain a 24-hour parts and service organization. This organization shall regularly engage in maintenance contract programs to perform preventive maintenance and service on equipment similar to that specified. A service agreement shall be available and shall include system operation under simulated operating conditions; adjustment to the generator set, transfer switch, and switchgear controls as required, and certification in the owner's maintenance log of repairs made and functional tests performed on all systems.

B Special Warranty

C Extended Correction Period

PART 2 PRODUCTS

2.1 Equipment

A Equipment
1. The generator set shall be a Kohler model 100REZGD with a 4R12X alternator. It shall provide 125.00 kVA and 100.00 kW when operating at 120/208 volts, 60 Hz, 0.80 power factor. The generator set shall be capable of a 130°C Standby rating while operating in an ambient condition of less than or equal to 77 °F and a maximum elevation of 500 ft above sea level. The standby rating shall be available for the duration of the outage.

B Engine
1. The minimum 5.7 liter displacement engine shall deliver a minimum of 155 HP at a governed engine speed of 1800 rpm, and shall be equipped with the following:
a. Electronic isochronous governor capable of 0.5% steady-state frequency regulation
b. 12-volt positive-engagement solenoid shift-starting motor
c. 70-ampere automatic battery charging alternator with a solid-state voltage regulation
d. Positive displacement, full-pressure lubrication oil pump, cartridge oil filters, dipstick, and oil drain
e. Dry-type replaceable air cleaner elements for normal applications
f. The engine shall be turbocharged and fueled by LP vapor.
g. The engine shall have a minimum of 8 cylinders and be liquid-cooled
2. The engine shall be EPA certified from the factory

3. The generator must accept rated load in one-step.

C Cooling System
1. The engine shall be liquid-cooled by a closed loop, unit mounted radiator rated to operate the generator set at full load at an ambient temperature of 50 degrees C (122 degrees F). The radiator fan and other rotating engine parts shall be guarded against accidental contact.

D Standard Air Cleaner
1. The air cleaner shall provide engine air filtration which meets the engine manufacturer's specifications under typical operating conditions.

E Battery
1. Each genset requires a maintenance free BCI group 24 battery which must meet the engine manufactures' specifications for the ambient conditions specified in Part 1 Project Conditions and shall comply with the NFPA requirements for engine cranking cycles. This battery shall be rated according to SAE Standards J-537 with a minimum cold cranking amp of 650 amps and a minimum reserve capacity of 120 Minutes at 80F. The battery plates shall be constructed of a Calcium-Lead alloy to provide long waterless operation and extended battery life. The battery must contain a handle to aid in lifting and the case must be constructed of polypropylene to resist breakage and extend service life.
2. Battery rack and battery cables capable of holding the manufacturer's recommended batteries shall be supplied.

F Housing
1. Level 1 Sound Attenuated Enclosure
   a The generator set shall be supplied with a Sound Attenuated Enclosure, providing a sound pressure of 72 dB(A) while the generator is operating at 100% load at 7 meters (23 feet) – free field – using acoustic insulation and acoustic-lined inlet hoods, constructed from high strength, low alloy 14 gauge galvanized steel. The acoustic insulation used shall meet UL 94 HF1 flammability classification. The enclosure shall be manufactured from bolted panels to facilitate service, future modifications, or field replacement. The enclosure shall use external vertical air inlet and outlet hoods with 90 degree angles to discharge air up and reduce noise. The enclosure shall have an integral rodent guard and skid end caps and shall have bracing to meet 241 kph (150 mph) wind loading.
   b The enclosure components and skid shall be cleaned with a two-stage alkaline cleaning process to remove grease, grit, and grime from parts. Components shall then be subjected to a Zirconium-based conversion coating process to prepare the metal for electrocoat (e-coat) adhesion. All enclosure parts shall receive an 100% epoxy primer electrocoat (e-coat) with high-edge protection. Following the e-coat process, the parts shall be finish coated with powder baked paint for superior finish, durability, and appearance with a Power ArmorTM industrial finish that provides heavy duty durability in harsh conditions, and is fade-, scratch- and corrosion-resistant.
   c The enclosure must surpass a 3,000 hour salt spray corrosion test per ASTM B-1117.
   d Enclosures will be finished in the manufacturer's standard color.
   e The enclosures shall allow the generator set to operate at full load in an ambient temperature of 50°C with no additional derating of the electrical output of the generator set.
   f Enclosures shall be equipped with sufficient side and end doors to allow access for operation, inspection, and service of the unit and all options. Minimum requirements are two doors per side. When the generator set controller faces the rear of the generator set, an additional rear facing door is required. Access to the controller and main line circuit breaker shall meet the requirements of the National Electric Code.
   g Doors shall be fitted with hinges, hardware, and the doors shall be removable.

h Doors shall be equipped with lockable latches. Locks shall be keyed alike. Door locks shall be recessed to minimize potential of damage to door/enclosure.

i A duct between the radiator and air outlet shall be provided to prevent re-circulation of hot air.

j The complete exhaust system shall be internal to the enclosure.

k The critical silencer shall be fitted with a tailpipe and rain cap.

G Fuel oil storage

H Controller

1. Decision-Maker® 3000 Generator Set Controller
    a. The generator set controller shall be a microprocessor based control system that will provide automatic starting, system monitoring, and protection. The controller system shall also provide local monitoring and remote monitoring. The control system shall be capable of PC based updating of all necessary parameters, firmware, and software.
    b. The controller shall be mounted on the generator set and shall have integral vibration isolation. The controller shall be prototype and reliability tested to ensure operation in the conditions encountered.
2. Codes and Standards
    a. The generator set controller shall meet NFPA 110 Level 1 requirements and shall include an integral alarm horn as required by NFPA.
    b. The controller shall meet NFPA 99 and NEC requirements.
    c. The controller shall be UL 508 listed.
3. Applicability
    a. The controller shall be a standard offering in the manufacturer's controller product line.
    b. The controller shall support 12-volt and 24volt starting systems.
    c. The controller's environmental specification shall be: -40°C to 70°C operating temperature range and 5-95% humidity, non-condensing.
    d. The controller shall mount on the generator or remotely within 40 feet with viewable access.
4. Controller Buttons, Display and Components
    a. The generator set controller shall include the following features and functions:
        1. Push button Master Control buttons. The buttons shall be tactile-feel membrane with an indicator light to initiate the following functions:
            a. Run Mode: When in the run mode the generator set shall start as directed by the operator.
            b. Off/Reset Mode: When in the Off/Reset mode the generator set shall stop, the reset shall reset all faults, allowing for the restarting of the generator set after a shutdown.
            c. Auto Mode: When in Auto the mode the generator set shall be ready to accept a signal from a remote device.
        2. Emergency Stop Switch. The remote stop switch shall be red in color with a "mushroom" type head. Depressing the stop button will immediately stop the generator set and lockout the generator set for any automatic remote starting.
        3. Push Button/Rotary Selector dial. This dial shall be used for selection of all Menus and sub-menus. Rotating the dial moves you through the menus, pushing the dial selects the menu and function/features in that menu. Pushing the button selects the feature/function and sub-menus.
        4. Digital Display. The digital display shall be alphanumeric, with 2 lines

of data and approximately 24 charters. The display shall have back lighting for ease of operator use in high and low light conditions. The display shall display status of all faults and warnings. The display shall also display any engine faults. While the generator set is running, the display shall scroll all-important information across the screen for ease of operator use. The scroll can be stopped by pushing the rotary dial. The display shall fall asleep when the generator set is not running and will wake-up when the generator set starts or the rotary dial is depressed.

5. Fault Light. The controller shall have an annunciator fault light that glows red for faults and yellow for warnings. These faults and warnings shall be displayed in the digital display. The fault light will also glow yellow when not in AUTO.
6. Alarm Horn. The controller shall provide an alarm horn that sounds when any faults or warnings are present. The horn shall also sound when the controller is not in the AUTO mode.
7. Alarm Silence/Lamp Test Button. When this button is depressed, it shall test all controller lamps. This button will also silence the alarm horn when the unit is not AUTO.
8. USB Connection. The controller shall have a USB connection on the face of the controller. This connection shall allow for updating of all software and firmware. This port shall also allow for all servicing of generator set parameters, fault diagnostics and viewing of all controller information via use a laptop computer.
9. Dedicated user inputs. The controller shall have dedicated inputs for remote emergency stop switch, remote 2-wire star for transfer switch and auxiliary shutdown.
10. The controller shall have auto resettable circuit protection integral on the circuit board.

5. System Controller Monitoring and Status Features and Functions
   a. The generator controller shall display and monitor the following engine and alternator functions and allow adjustments of certain parameters at the controller:
      1. Overview menu
         a. Active shutdowns and warnings shall be displayed if present and without the need of operator interface
         b. Engine runtime with total hours
         c. Average line to line voltage
         d. Coolant temperature
         e. Fuel level or pressure
         f. Oil pressure
         g. Battery voltage
         h. Software version
         i. Frequency
         j. Average current
      2. Engine metering menu.
         a. Engine speed
         b. Oil pressure
         c. Coolant temperature
         d. Battery voltage
      3. Generator metering menu.

a. Total power in VA
b. Total power in W
c. Rated power % used
d. Voltage L-L and L-N for all phases
e. Current L1, L2, L3
f. Frequency

4. Generator set information.
   a. Generator set model number
   b. Generator set serial number
   c. Controller set number
5. Generator set run time.
   a. Engine run time total hours
   b. Engine loaded total hours
   c. Number of engine starts
   d. Total energy in kW
6. Generator set system
   a. System voltage
   b. System frequency 50/60Hz
   c. System phase, single/three phase
   d. Power rating kW
   e. Amperage rating
   f. Power type standby/prime
   g. Measurement units, metric/English units adjustable
   h. Alarm silence, always or auto only
7. Generator set calibration, the following are adjustable at the controller.
   a. Voltage L-L and L-N all phases
   b. Current L1, L2, L3
   c. Reset all calibrations
8. Voltage regulation, +/-0.5% regulation, the following is adjustable at the controller.
   a. Voltage Adjustable +/- 10%
9. Digital and Analog Inputs and outputs
   a. Displays settings and status
10. Event Log
    a. Stores event history, up to 1000 events

6. Controller Engine control features and functions
   a. Automatic restart - the controller has automatic restart feature that initiates the start routine and re-crank after a failed start attempt.
   b. Cyclic cranking - the controller shall have programmable cyclic cranking
   c. Engine starting aid - the controller shall have the capability of providing control for an optional engine starting aid.
   d. The control system shall include time delays for engine start and cool down.
   e. The control system shall interface with the engine ECM and display engine fault codes and warnings. The ECM shall also include sender failure monitoring to help distinguish between failed senders and actual failure conditions.
   f. The controller shall monitor and display engine governor functions with include steady state and transient frequency monitoring
7. Controller Alternator control features and functions
   a. Integrated hybrid voltage regulator. The system shall have integral microprocessor based voltage regulator system that provides +/- 5% voltage

regulation, no-load to full load with three phase sensing. The system is prototype tested and control variation of voltage to frequency. The voltage regulator shall be adjustable at the controller with maximum +/- 10% adjustable of nominal voltage.

b. AC output voltage regulator adjustment. The system shall allow for adjustment of the integral voltage regulator with maximum of +/- 10% adjustment of the system voltage.
c. Alternator thermal overload protection. The system shall have integral alternator overload and short circuit protection matched to each alternator for the particular voltage and phase configuration.
d. Power metering. The controller digitally displays power metering of kW and kVA.

8. Other control features and functions
   a. Event logging. The controller keeps a record of up to 1000 events, for warning and shutdown faults. This fault information becomes a stored record of systems events and can be reset.
   b. Historical data logging. The controller total number of generator set successful start shall be recorded and displayed.
   c. Programmable access. The control system shall include a USB port that gives service technicians the ability to provide software and firmware upgrades. The system shall also be capable of allowing setting of all critical parameters using the service software and a laptop computer. All parameters and setting should be capable to being stored on a laptop for future upgrades of printing for analysis.
9. Generator Set Warning, Shutdown Alarm and Status
   a. The generator set shall have alarms and status indication lamps that show non-automatic status and warning and shutdown conditions. The controller shall indicate with a warning lamp and or alarm and on the digital display screen any shutdown, warning or engine fault condition that exists in the generator set system. The following alarms and shutdowns shall exist as a minimum:
      1. Engine functions
         a. Critical high fuel level (alarm)
         b. ECM communication loss (shutdown)
         c. ECM diagnostics (alarm & shutdown)
         d. Engine overspeed (shutdown)
         e. Engine start aid active
         f. Engine under speed (shutdown)
         g. Fuel tank leak (alarm & shutdown)
         h. High DC battery voltage (alarm)
         i. High coolant temperature (alarm & shutdown)
         j. High fuel level (alarm)
         k. Low DC battery voltage (alarm)
         l. Low coolant level (shutdown)
         m. Low coolant temperature (alarm)
         n. Low cranking voltage (alarm)
         o. Low engine oil level (alarm & shutdown)
         p. Low fuel level (alarm & shutdown)
         q. Low fuel pressure (alarm)
         r. Low oil pressure (alarm & shutdown)
         s. No coolant temperature signal (shutdown)

t. No oil pressure signal (shutdown)
u. Overcrank (shutdown)
v. Speed sensor fault (alarm)

2. Generator functions
   a. AC sensing loss over & under current (alarm & shutdown)
   b. Alternator protection (shutdown)
   c. Ground fault input (alarm)
   d. kW overload (shutdown)
   e. Locked rotor (shutdown)
   f. Over-frequency (shutdown)
   g. Over AC voltage (shutdown)
   h. Under-frequency (shutdown)
   i. Under AC voltage (shutdown)
   j. Emergency stop (shutdown)
3. Other General functions
   a. Battery charger fault (alarm)
   b. Common fault (shutdown)
   c. Common warning (alarm)
   d. Master switch not in auto (alarm)
   e. Generator running
   f. Input/Output fault (alarm)
4. The generator set controller shall also be capable of meeting all necessary NFPA 110 level 1 requirements that include several of the above along with; EPS supplying load, Master switch “not in auto”, and contacts for local and remote common alarm.

10. Communications
    a. If the generator set engine is equipped with an ECM (engine control module), the controller shall communicate with the ECM for control, monitoring, diagnosis, and meet SAE J1939 standards
    b. Kohler proprietary RBUS communication shall be available.
    c. A RBUS shall be able to monitor and alter parameters, and start or stop a generator.
    d. The controller shall have the capability to communicate to a personal computer (IBM or compatible) and appropriate application software
    e. A variety of connections shall be available based on requirements:
       1. A single control connection to a PC via USB
       2. Internet connection via Ethernet
    f. Generator and transfer switch controls shall be equipped with communications modules capable of connecting to the same communication network.

I Generator Overcurrent and Fault Protection

1. The generator shall be provided with a factory installed, 100% rated line circuit breaker rated at 400.00 amperes that is UL489 listed. Line circuit breakers shall be sized for the rated ampacity of the loads served by the breaker per the NEC.
2. The circuit breaker(s) shall incorporate an electronic trip device with the following characteristics:
3. Adjustable long time delay
4. Adjustable short time delay *[As applicable]*
5. Instantaneous
6. Load side lugs shall be provided from the factory. The line circuit breaker shall

include auxiliary contacts, shunt trip, undervoltage trip, alarm switch, and overcurrent switch functionality. Load side breaker connections made at the factory shall be separated from field connections.

7. The shunt trip device shall be connected to trip the generator breaker when the generator-set is shut down by other protective devices.
8. When GFI is required per the NEC, additional neutrals shall be factory installed, and the alarm indication shall be integrated with the generator-set alarms.
9. Barriers to provide segregation of wiring from an emergency source to emergency loads from all other wiring and equipment, if required by the NEC, shall be provided.

J Alternator

1. The alternator shall be salient-pole, brushless, 2/3-pitch, with 4 bus bar provision for external connections, self-ventilated, with drip-proof construction and amortisseur rotor windings, and skewed for smooth voltage waveform. The ratings shall meet the NEMA standard (MG1-32.40) temperature rise limits. The insulation shall be class H per UL1446 and the varnish shall be a vacuum pressure impregnated, fungus resistant epoxy. Temperature rise of the rotor and stator shall be limited to 130°C Standby. The PMG based excitation system shall be of brushless construction controlled by a digital, three phase sensing, solid- state, voltage regulator. The AVR shall be capable of proper operation under severe nonlinear loads and provide individual adjustments for voltage range, stability and volts-per-hertz operations. The AVR shall be protected from the environment by conformal coating. The waveform harmonic distortion shall not exceed 5% total RMS measured line-to-line at full rated load. The TIF factor shall not exceed 50.
2. The alternator shall have a maintenance-free bearing, designed for 40000 hour B10 life. The alternator shall be directly connected to the flywheel housing with a semi-flexible coupling between the rotor and the flywheel.
3. The generator shall be inherently capable of sustaining at least 300% of rated current for at least 10 seconds under a 3-phase symmetrical short circuit without the addition of separate current-support devices.
4. Motor starting performance and voltage dip determinations shall be based on the complete generator set. The generator set shall be capable of supplying 336.00 LRKVA for starting motor loads with a maximum instantaneous voltage dip of 35%, as measured by a digital RMS transient recorder in accordance with IEEE Standard 115. Motor starting performance and voltage dip determination that does not account for all components affecting total voltage dip, i.e., engine, alternator, voltage regulator, and governor will not be acceptable. As such, the generator set shall be prototype tested to optimize and determine performance as a generator set system.

K Vibration Isolation

1. Vibration isolators shall be provided between the engine-alternator and heavy-duty steel base.

2.2 Description

A Regulatory Requirements

B Sustainability Characteristics

2.3 Performance / Design Criteria

A Capacities

2.4 Operation

A Operators

B Controls

C Operation Sequence

2.5 Materials

2.6 Assembly or Fabrication

A Factory Assembly

B Shop Fabrication

C Assembly or Fabrication Tolerances

2.7 Mixes

2.8 Finishes

A Primer Materials

B Finish Materials

C Shop Finishing Materials

2.9 Accessories

A. The generator set shall be supplied with a 10-ampere automatic float/equalize battery charger capable of charging both lead-acid and ni-cad type batteries, with the following features:
   i. Automatic 3-stage float to equalization charge
   ii. Voltage regulation of 1% from no to full load over 10% AC input line voltage variations
   iii. Battery charging current Ammeter and battery voltage voltmeter with 5% full-scale accuracy
   iv. LED lamp for power ON indication
   v. Current limited during engine cranking, short circuit, and reverse polarity conditions
   vi. Temperature compensated for ambient temperatures for -40°C to 60°C
   vii. Alarm circuit board featuring alarm contacts for low battery voltage, high battery voltage, and battery charger malfunction.
   viii. UL 1012 Listed
   ix. CSA Certified

B. The air cleaner restriction indicator shall indicate the need for maintenance of the air cleaners.

C. Skid end caps – Steel plates will be installed on each end of the skid to close in and make the ends of the skid flush.

D. The generator set shall be furnished with rodent guards to prevent rodent intrusion and protect internal components.

E. Battery rack and battery cables capable of holding the manufacturer's recommended batteries shall be supplied.

F. Block Heater - The block heater shall be thermostatically controlled, 1,500 watt, 110-120 VAC - single phase, to maintain manufacturers recommended engine coolant temperature to meet the start-up requirements of NFPA 99 and NFPA 110, Level 1.

G. The exhaust piping shall be gas proof, seamless, stainless steel, flexible exhaust bellows and includes the flex exhaust tube and the mounting hardware.

H. Remote annunciator panel – The remote annunciator shall meet NFPA 110, Level 1 requirements and enable remote viewing of the generator status. The panel shall be connected to the generator controller via either network communication wires or via hard wired connections. Options shall be available to provide ATS source availability, contactor position, and loaded or unloaded test for up to four transfer switches. The panel shall have the capability to be either flush- mounted or surface-mounted. The annunciator shall meet UL508 requirements.

I. The generator set shall be supplied with a common failure relay to provide means of signaling fault and/or shutdown conditions.
   i. The common failure relay shall remotely signal auxiliary faults, emergency stop, high engine temperature, low oil pressure, overcrank, and over speed via one single-pole, double-throw relay with 10 amps at 120 VAC contacts.
   ii. The relay contacts shall be gold flashed to allow use of low current draw devices (100ma @ 28VDC min.).

iii. Once energized the relay shall remain latched until the system is reset by the main controller switch.

J. The generator set shall be provided with a run relay which shall provide a three-pole, double-throw relay with 10-amp/ 250 VAC contacts to indicate that the generator is running. The run relay dry contacts can be used for energizing or de-energizing customer devices while the generator is running (e.g. louvers, indicator lamps, etc.)

2.10 Source Quality Control

A. Non-Conforming Work

1. To ensure that the equipment has been designed and built to the highest reliability and quality standards, the manufacturer and/or local representative shall be responsible for three separate tests: design prototype tests, final production tests, and site tests.

a. **Design Prototype Tests.** Components of the emergency system, such as the engine/generator set, transfer switch, and accessories, shall not be subjected to prototype tests because the tests are potentially damaging. Rather, similar design prototypes and preproduction models shall be subject to the following tests:

i. Maximum power (kW)
ii. Maximum motor starting (kVA) at 35% instantaneous voltage dip.
iii. Alternator temperature rise by embedded thermocouple and/or by resistance method per NEMA MG1-32.6.
iv. Governor speed regulation under steady-state and transient conditions.
v. Voltage regulation and generator transient response.
vi. Harmonic analysis, voltage waveform deviation, and telephone influence factor.
vii. Three-phase short circuit tests.
viii. Alternator cooling air flow.
ix. Torsional analysis to verify that the generator set is free of harmful torsional stresses.
x. Endurance testing.

b. **Final Production Tests.** Each generator set shall be tested under varying loads with guards and exhaust system in place. Tests shall include:

i. Single-step load pickup
ii. Safety shutdown device testing
iii. Rated Power @ 0.8 PF
iv. Maximum power
v. Upon request, a witness test, or a certified test record sent prior to shipment.

c. **Site Tests.** The manufacturer's distribution representative shall perform an installation check, startup, and building load test. The engineer, regular operators, and the maintenance staff shall be notified of the time and date of the site test. The tests shall include:

i. Fuel, lubricating oil, and antifreeze shall be checked for conformity to the manufacturer's recommendations, under the environmental conditions present and expected.
ii. Accessories that normally function while the set is standing by shall be checked prior to cranking the engine. These shall include: block heaters, battery chargers, alternator strip heaters, remote annunciators, etc.
iii. Generator set startup under test mode to check for exhaust leaks, path of exhaust gases outside the building, cooling air flow, movement during starting and stopping, vibration during operation,

normal and emergency line-to-line voltage and frequency, and phase rotation.

iv. Automatic start by means of a simulated power outage to test remote-automatic starting, transfer of the load, and automatic shutdown. Prior to this test, all transfer switch timers shall be adjusted for proper system coordination. Engine coolant temperature, oil pressure, and battery charge level along with generator set voltage, amperes, and frequency shall be monitored throughout the test.

B Non-Conforming Work
C Manufacturer's Services
D Coordination of Other Tests and Inspections

PART 3 - EXECUTION

3.1 Installers
A Installer List
B Substitution Limitations

3.2 Examination
A Verification of Conditions
B Pre-installation Testing
C Evaluation and Assessment

3.3 Preparation
A Protection of In-place Condition
B Surface Preparation
C Demolition/ Removal

3.4 Installation
A Special Techniques
B Interface with Other Work
C System Integration
D Tolerances

3.5 Field or Site Quality Control
A Field or Site Tests and Inspection
B Non-Conforming Work
C Manufacturer's Services

3.6 Closeout Activities
A Demonstration
B Training

3.7 CLEANING AND PROTECTION: Protect newly installed equipment until completion of project. Clean, test, and adjust as required for proper performance. Finished surfaces shall be restored to their original texture and finish. Lighting fixtures shall be cleaned, metal and glass work polished, and lamps wiped clean.

END OF SECTION

SECTION 26 32 23 - AUTOMATIC TRANSFER SWITCH

PART 1 GENERAL

1.1 SUMMARY

A This section includes the following items from a single supplier:
1. Automatic transfer switch
2. Related Accessories as specified

B Products Furnished or Supplied but not installed

C Products Installed but not furnished or supplied

D Related Requirements
1. It is the intent of this specification to secure an automatic transfer switch that has been prototype tested, factory built, production-tested, and site-tested together with all accessories necessary for a complete installation as shown on the plans and drawings and specified herein.
2. Any exceptions to the published specifications shall be subject to the approval of the engineer and submitted minimum 10 days prior to the closing of the bid with a line by line summary description of all the items of compliance, any items that have been are omitted or have been taken exception to, and a complete description of all deviations.
3. It is the intent of this specification to secure an automatic transfer switch that has been tested during design verification, in production, and at the final job site. The automatic transfer switch will be a commercial design and will be complete with all of the necessary accessories for complete installation as shown on the plans, drawings, and specifications herein. The equipment supplied shall meet the requirements of the National Electrical Code and applicable local codes and regulations.
4. All equipment shall be new and of current production by an international, power system manufacturer of generators, transfer switches, and paralleling switchgear. The manufacturer shall be a supplier of a complete and coordinated system. There will be single-source responsibility for warranty, parts, and service through a factory-authorized representative with factory-trained technicians.

1.2 PRICE AND PAYMENT PROCEDURES

A Allowances

B Unit Prices

C Alternates or Alternatives

D Measurement and Payment

1.3 REFERENCES

A Abbreviations and Acronyms

B Definitions

C Reference Standards

1.4 ADMINISTRATIVE REQUIREMENTS

A Coordination
B Pre-installation Meeting
C Sequencing
D Scheduling

1.5 SUBMITTALS

A Action Submittals
1. Product Data
a The submittal shall include specification sheets showing all standard and optional accessories to be supplied; schematic wiring diagrams, dimension drawings, and interconnection diagrams identifying by terminal number each required interconnection between the generator set, the transfer switch, and the remote annunciator panel if it is included elsewhere in these specifications.
2. Shop Drawings
3. Samples

B Informational Submittal
1. Certificates
2. Test and Evaluation Reports
3. Manufacturer's Instruction
4. Source Quality Control Submittals
5. Field or Site Quality Control
6. Manufacturer's Report
7. Special Procedure Submittal
8. Qualification Statement

C Closeout Submittals
1. Maintenance Contracts
2. Operation And Maintenance Data
3. Bonds
4. Warranty Documentation
5. Record Documentation
6. Software

D Maintenance Material Submittals
1. Literature
2. Spare Parts
3. Extra Stock Materials
4. Tools

1.6 Quality Assurance

A Regulatory Agency

1. The automatic transfer switch shall conform to the requirements of the following codes and standards:
   a UL 1008 - Standard for Transfer Switch Equipment
   b IEC 947-6-1 Low-voltage Switchgear and Control gear; Multifunction equipment; Automatic Transfer Switching EquipmentEN55011, Limits and Methods of Measurement of Radio Interference Characteristics of Industrial, Scientific and Medical Equipment.
   c NFPA 70 - National Electrical Code
   d NFPA 99 - Essential Electrical Systems for Health Care Facilities
   e NFPA 110 - Emergency and Standby Power Systems
   f IEEE Standard 446 - IEEE Recommended Practice for Emergency and Standby Power Systems for Commercial and Industrial Applications
   g NEMA Standard ICS 10-2005, Electromechanical AC Transfer Switch Equipment.
   h EN61000-4-4 Fast Transient Immunity Severity Level 4
   i EN61000-4-5 Surge Immunity Class 4 (voltage sensing and programmable inputs only)
   j IEEE 472 (ANSI C37.90A) Ring Wave Test
   k IEC Specifications for EMI/EMC Immunity (CISPR 11, IEC 1000-4-2, IEC 1000-4-3, IEC 1000-4-4, IEC 1000-4-5, IEC 1000-4-6, IEC 1000-4-8, IEC 1000-4-11)
   l CSA C22.2 No. 178 certification
2. Qualifications
   a The automatic transfer switch shall be produced by a manufacturer who is ISO 9001 certified for the design, development, production and service of its complete product line.
   b A manufacturer who has produced this type of equipment for a period of at least 10 years and who maintains a service organization available twenty-four hours a day throughout the year shall produce the automatic transfer switch.
3. Manufacturers
   a The automatic transfer switch shall be furnished by a single manufacturer who shall be responsible for the design, coordination, and testing of the complete system. The entire system shall be installed as shown on the plans, drawings, and specifications herein.
   b The manufacturer shall maintain a national service organization of employing personnel located throughout the contiguous United States. The Service center's personnel must be factory trained and must be on call 24 hours a day, 365 days a year.
   c The manufacturer shall maintain records of each switch, by serial number, for a minimum of 20 years.
4. Suppliers
5. Fabricators
6. Installers/ Applicators/ Erectors

7. Testing Agencies
8. Licensed Professional
9. Certificates
10. Preconstruction testing
11. Field and Site Samples
12. Mock-ups

1.7 Delivery, Storage, and Handling

A Delivery and Acceptance Requirements

B Storage and Handling Requirements

C Packaging Waste Management

1.8 Field or Site Conditions

A Ambient Conditions

1. Automatic transfer switch shall operate in the following conditions without any damage to the unit or its loads.
   a Ambient Temperature: -4 to 158 Degrees F
   b Relative Humidity: 5% to 95% noncondensing

B Existing Conditions

1.9 Warranty or Bond

A Manufacturer’s Warranty

1. The ATS shall include a standard warranty covering five (5) years to guarantee against defective material and workmanship in accordance with the manufacturer's published warranty from the date of initial startup. Labor and travel charges for the third, fourth, and fifth years are not covered by this warranty.
2. The ATS manufacturer and its distributor shall maintain a 24-hour parts and service organization. This organization shall regularly engage in maintenance contract programs to perform preventive maintenance and service on equipment similar to that specified. A service agreement shall be available and shall include system operation under simulated operating conditions; adjustment to the generator set, transfer switch, and switchgear controls as required, and certification in the owner's maintenance log of repairs made and functional tests performed on all systems.

B Special Warranty

C Extended Correction Period

PART 2 - PRODUCTS

2.1 Equipment

A Equipment

1. Furnish and install an automatic transfer switches system(s) with 4-Pole / 4-Wire, Switched Neutral,

2. #NO TRADUCTION Amps, 208V/60Hz. Each automatic transfer shall consist of an inherently double throw power transfer switch mechanism and a microprocessor controller to provide automatic operation. All transfer switches and controllers shall be the products of the same manufacturer.

B Manufacturer

1. Automatic transfer switches shall be Kohler Any Breaker Rated - Standard Transition (KCS)/KCS-ACVA-##. Any alternate shall be submitted for approval to the consulting engineer at least 10 days prior to bid date. Alternate bids shall include a line-by-line clarification of the specification marked with "D" for deviation; "E" for exception, and "C" for comply.

C Construction

1. The transfer switch shall be electrically operated and mechanically held with double throw construction, and operated by a momentarily energized solenoid-driven mechanism.
2. All transfer switch sizes shall use only one type of main operator for ease of maintenance and commonality of parts.
3. The switch shall be positively locked and unaffected by momentarily outages, so that contact pressure is maintained at a constant value and contact temperature rise is minimized for maximum reliability and operating life.
4. All main contacts shall be silver composition. Switches rated 600 amperes and above shall have segmented, blow-on construction for high withstand and close-on capability and be protected by separate arcing contacts.
5. Inspection of all contacts shall be possible from the front of the switch without disassembly of operating linkages and without disconnection of power conductors. Switches rated 800 amperes and higher shall have front removable and replaceable contacts. All stationary and moveable contacts shall be replaceable without removing power conductors and/or bus bars.
6. Designs utilizing components of molded-case circuit breakers, contactors, or parts thereof, which are not intended for continuous duty, repetitive switching or transfer between two active power sources, are not acceptable.
7. For two and three pole switches, where neutral conductors are to be solidly connected as shown on the plans, a neutral conductor plate with fully rated AL-CU pressure connectors shall be provided.
8. For four pole switches with a switching neutral, where neutral conductors must be switched as shown on the plans, the contactor shall be provided with fully rated switched neutral transfer contacts. Overlapping neutral contacts may be used as an alternative.

D Enclosure

1. The ATS shall be furnished in a NEMA 1 enclosure.
2. All standard door mounted switches and indicating LEDs shall be integrated into a flush-mounted, interface membrane or equivalent in the enclosure door for easy viewing & replacement. The panel shall be capable of having a manual locking feature to allow the user to lockout all membrane mounted control switches to prevent unauthorized

tampering. This cover shall be mounted with hinges and have a latch that may be padlocked. The membrane panel shall be suitable for mounting by others when furnished on open type units.

2.2 Description

A Regulatory Requirements

B Sustainability Characteristics

2.3 Performance / Design Criteria

A Capacities

2.4 Operation

A Operators

B Controls

1. A four line, 20 character LCD display and dynamic 4 button keypad shall be an integral part of the controller for viewing all available data and setting desired operational parameters. Operational parameters shall also be available for viewing and control through the communications interface port or USB. The following parameters shall only be adjustable via a password protected programming on the controller:
   a Nominal line voltage and frequency
   b Single or three phase sensing
   c Operating parameter protection
   d Transfer operating mode configuration (Standard transition, Programmed transition, or Closed transition)

C Voltage and Frequency

1. Voltage (all phases) and frequency on both the normal and emergency sources shall be continuously monitored. Voltage on both normal and emergency sources and frequency on the emergency sources shall be adjustable with the following pickup, dropout, and trip setting capabilities (values shown as % of nominal unless otherwise specified):

	Parameter	Dropout/Trip	Pickup/Reset
a	Under voltage	75 to 98%	85 to 100%
b	Over voltage	06 to 135%	95 to 100% of trip
c	Under frequency	95 to 99%	80 to 95%
d	Over frequency	01 to 115%	105 to 120%
e	Voltage unbalance	5 to 20%	3 to 18%

2. Repetitive accuracy of all settings shall be within ± 0.5% over an operating temperature range of -20°C to 70°C.
3. An adjustable dropout time for transient voltage and frequency excursions shall be provided. The time delays shall be 0.1 to 9.9 seconds for voltage and .1 to 15 seconds for frequency.
4. Voltage and frequency settings shall be field adjustable in 1% increments either locally with the display and keypad, remotely via the communications interface port or USB.
5. The controller shall be capable of sensing the phase rotation of both the normal and emergency sources. The source shall be considered unacceptable if the phase rotation is not the preferred rotation selected (ABC or BAC). Unacceptable phase rotation shall be

indicated on the LCD; the service required LED and the annunciation through the communication protocol and dry contacts. In addition, the phase rotation sensing shall be capable of being disabled, if required.

6. The controller shall be capable of detecting a single phasing condition of a source, even though a voltage may be regenerated by the load. This condition is a loss of phase and shall be considered a failed source.
7. Source status screens shall be provided for both normal & emergency to provide digital readout of voltage on all 3 phases (phase to phase and phase to neutral), frequency, and phase rotation.

D Time Delays

1. An adjustable time delay of 0 to 6 seconds shall be provided to override momentary normal source outages and delay all transfer and engine starting signals. Capability shall be provided to extend this time delay to 60 minutes by providing an external 12 or 24 VDC power supply.
2. A time delay shall be provided on transfer to the emergency source, adjustable from 0 to 60 minutes, for controlled timing of transfer of loads to emergency.
3. A time delay shall be provided on re-transfer to normal. The time delays shall be adjustable from 0 to 60 minutes. Time delay shall be automatically bypassed if the emergency source fails and the normal source is acceptable.
4. A time delay shall be provided on shut down of engine generator for cool down, adjustable from 0 to 60 minutes.
5. A time delay activated output signal shall also be provided to drive external relay(s) for selective load disconnect and reconnect control. The controller shall be capable of controlling a maximum of 9 individual output time delays to step loads on after a transfer occurs. Each output may be individually programmed for their own time delay of up to 60 minutes. Each sequence shall be independently programmed for transferring from normal to emergency and transferring from emergency to normal.
6. All time delays shall be adjustable in 1 second increments.
7. All time delays shall be adjustable by using the display and keypad, with a remote device connected to the communications interface port or USB.
8. Each time delay shall be identified and a dynamic countdown shall be shown on the display. Active time delays can be viewed with a remote device connected to the communications interface port or USB.

E Additional Features

1. The controller shall have 3 levels of security. Level 1 shall allow monitoring of settings and parameters only. The Level 1 shall be capable of restricted with the use of a lockable cover. Level 2 shall allow test functions to be performed and Level 3 shall allow setting of all parameters.
2. The display shall provide for the test functions, allowed through password security. The test function shall be load, no load or auto test. The auto test function shall request an elapsed time for test. At the completion of this time delay the test shall be automatically ended and a retransfer sequence shall commence. All loaded tests shall be immediately

ended and retransfer shall occur if the emergency source fails and the normal source is acceptable.

3. A contact closure shall be provided for a low-voltage engine start signal. The start signal shall prevent dry cranking of the engine by requiring the generator set to reach proper output, and run for the duration of the cool down setting, regardless of whether the normal source restores before the load is transferred.
4. Auxiliary contacts shall be provided consisting of a minimum of two contacts, closed when the ATS is connected to the normal source and two contacts closed, when the ATS is connected to the emergency source.
5. LED indicating lights shall be provided; one to indicate when the ATS is connected to the normal source (green) and one to indicate when the ATS is connected to the emergency source (red).
6. LED indicating lights shall be provided and energized by controller outputs. The lights shall provide true source availability of the normal (green) and emergency sources (red), as determined by the voltage, frequency and phase rotation sensing trip and reset settings for each source.
7. A membrane switch shall be provided on the membrane panel to test all indicating lights and display when pressed.
8. Provide the ability to select “commit/no commit to transfer" to determine whether the load should be transferred to the emergency generator if the normal source restores before the generator is ready to accept the load.
9. Terminals shall be provided for a remote contact which opens to signal the ATS to transfer to emergency and for remote contacts which closes to inhibit transfer to emergency and/or retransfer to normal. Both of these inhibit signals can be activated through the keypad, communications interface port or USB. A “not-in-auto" LED shall indicate anytime the controller is inhibiting transfer from occurring.
10. An in-phase monitor shall be a standard feature in the controller. The monitor shall control transfer so that motor load inrush currents do not exceed normal starting currents, and shall not require external control of power sources. The in-phase monitor shall be specifically designed for and be the product of the ATS manufacturer. The in-phase monitor shall be capable of being enabled or disabled from the user interface, communications interface port or USB.
11. A time based load control feature shall be available to allow the prioritized addition and removal of loads based during transfer. This feature may be enabled for either or both sources. The user shall be able to control up to nine loads with independent timing sequences for pre and post transfer delays in either direction of transfer.
12. The controller shall provide 2 inputs for external controls that can be programmed from the following values:
    a Common fault, Remote test, Inhibit transfer, Low battery voltage, Peak shave, Time delay bypass, Load shed forced to OFF position (Programmed transition only)
13. The controller shall provide two form "C" contact outputs rated for up to 12A @ 240VAC or 2A @ 480VAC that can be programmed from the following values:
    a Aux switch open, Transfer switch aux contact fault, Alarm silenced, Alarm active, I/O communication loss, Contactor position, Exercise active, Test mode active, Fail to

transfer, Fail to acquire standby source, Source available, Phase rotation error, Not in automatic mode, Common alarm, In phase monitor sync, Load bank control active, Load control active, Maintenance mode active, Non-emergency transfer, Fail to open/close, Loss of phase, Over/under voltage, Over/under frequency, Voltage unbalance, Start signal, Peak shave active, Preferred source supplying load, Standby source supplying load

14. The controller shall be capable of expanding the number of inputs and outputs with additional modules.
15. Optional input/output modules shall be furnished which mount on the inside of the enclosure to facilitate ease of connections.
16. Engine Exerciser - The controller shall provide an internal engine exerciser. The engine exerciser shall allow the user to program up to 21 different exercise routines based on a calendar mode. For each routine, the user shall be able to:
    a Enable or disable the routine
    b Enable or disable transfer of the load during routine.
    c Set the start time, time of day, day of week, week of month (1st, 2nd, 3rd, 4th, alternate or every)
    d Set the duration of the run.
    e At the end of the specified loaded exercise duration the switch shall transfer the load back to normal and run the generator for the specified cool down period. All loaded exercises shall be immediately ended and retransfer shall occur if the standby source fails. The next exercise period shall be displayed on the main screen with the type of exercise, time and date. The type of exercise and the time remaining shall be display when the exercise is active. It shall be possible of ending the exercise event with a single button push.
17. Date and time - The date shall automatically adjust for leap year and the time shall have the capability of automatically adjusting for daylight saving and standard times.
18. System Status - The controller shall have a default display the following on:
    a System status
    b Date, time and type of the next exercise event
    c Average voltage of the preferred and standby sources
    d Scrolling through the displays shall indicate the following:
        i) Line to line and line to neutral voltages for both sources
        ii) Frequency of each source
        iii) Load current for each phase
        iv) Single or three phase operation
        v) Type of transition
        vi) Preferred source
        vii) Commit or no commit modes of operation
        viii) Source/source mode
        ix) In phase monitor enable/disable
        x) Phase rotation
        xi) Date and time

19. Controllers that require multiple screens to determine system status or display “coded" system status messages, which must be explained by references in the operator’s manual, are not permissible.
20. Self-Diagnostics - The controller shall contain a diagnostic screen for the purpose of detecting system errors. This screen shall provide information on the status input signals to the controller which may be preventing load transfer commands from being completed.
21. Communications Interface - The controller shall be capable of interfacing, through a standard communications with a network of transfer switches and generators. It shall be able to be connected via an RS-485 serial communication (up to 4000 ft. direct connect or multi-drop configuration). This module shall allow for seamless integration of existing or new communication transfer devices and generators.
22. The transfer switch shall also be able to interface to 3rd party applications using Modbus RTU open standard protocols utilizing Modbus register maps. Proprietary protocols shall not be acceptable.
23. The controller shall contain a USB port for use with a software diagnostic application available to factory authorized personnel for downloading the controller’s parameters and settings; exercise event schedules; maintenance records and event history. The application can also adjust parameters on the controller.
24. Data Logging - The controller shall have the ability to log data and to maintain the last 2000 events, even in the event of total power loss. The following events shall be time and date stamped and maintained in a non-volatile memory. The controller shall be able to display up to the last 99 events. The remaining events shall be accessible via the communications interface port or USB.
    a Event Logging
        i) Data, date and time indication of any event
    b Statistical Data
        i) Total number of transfers*
        ii) Total number of fail to transfers*
        iii) Total number of transfers due to preferred source failure*
        iv) Total number of minutes of operation*
        v) Total number of minutes in the standby source*
        vi) Total number of minutes not in the preferred source*
        vii) Normal to emergency transfer time
        viii) Emergency to normal transfer time
        ix) System start date
        x) Last maintenance date
        xi) * The statistical data shall be held in two registers. One register shall contain data since start up and the second register shall contain data from the last maintenance reset.
25. External DC Power Supply - An optional provision shall be available to connect up to two external 12/24 VDC power supply to allow the LCD and the door mounted control indicators to remain functional when both power sources are dead for extended periods of time. This module shall contain reverse battery connection indication and circuit protection.

F Operation Sequence

2.5 Materials

2.6 Assembly or Fabrication

A Factory Assembly

B Shop Fabrication

C Assembly or Fabrication Tolerances

2.7 Mixes

2.8 Finishes

A Primer Materials

B Finish Materials

C Shop Finishing Materials

2.9 Accessories

A. Seismic Certification. The seismic certification shall be available for 150-3000 amp switches with NEMA 1 enclosures. Certification shall depend on geographic location. Contact local distributor for details

2.10 Source Quality Control

A Test and Inspection

1. Upon request, the manufacturer shall provide a notarized letter certifying compliance with all of the requirements of this specification including compliance with the above codes and standards. The certification shall identify, by serial number(s), the equipment involved. No exceptions to the specifications, other than those stipulated at the time of the submittal, shall be included in the certification.
2. The ATS manufacturer shall be certified to ISO 9001 International Quality Standard and the manufacturer shall have third party certification verifying quality assurance in design/development, production, installation and servicing in accordance with ISO 9001.

B Non-Conforming Work

C Manufacturer’s Services

D Coordination of Other Tests and Inspections

PART 3 - EXECUTION

3.1 Installers

A Installer List

B Substitution Limitations

3.2 Examination

A Verification of Conditions

B Pre-installation Testing

C Evaluation and Assessment

3.3 Preparation

A Protection of In-place Condition
B Surface Preparation
C Demolition/ Removal

3.4 Installation

A Special Techniques
B Interface with Other Work
C System Integration
D Tolerances

3.5 Repair/ Restoration

3.6 Reinstallation

3.7 Field or Site Quality Control

A Field or Site Tests and Inspection
B Non-Conforming Work
C Manufacturer's Services

3.8 System Startup

3.9 Adjusting

3.10 Cleaning and Protection:

A Waste Management
B Protect newly installed equipment until completion of project. Clean, test, and adjust as required for proper performance. Finished surfaces shall be restored to their original texture and finish. Lighting fixtures shall be cleaned, metal and glass work polished, and lamps wiped clean

3.11 Closeout Activities

A Demonstration
B Training

END OF SECTION

SECTION 26 99 99 – IMPERIAL COUNTY STRUCTURED CABLING / COMMUNICATION STANDARDS

PART 1 – GENERAL

1.01 GOALS

County of Imperial has a cabling infrastructure standard for all new and existing facilities. This standard applies to all data and voice solutions. The data cabling shall support Ethernet, Fast Ethernet, Gigabit Ethernet, VOIP, and Video over IP solutions. The Structured Cabling will facilitate Voice (VOIP), Data, Copiers, Fax's, WiFi, Kronos Clocks, Cameras, Access Control Devices and Wireless Network Antennas for our connected County Network. The traditional voice cabling shall support traditional phone systems, as well as fax communications. This standard ensures the county will receive a quality installation, guaranteed performance, and reduce on-going maintenance costs.

1.02 STANDARDS AND CODES

All aspects of the installation must follow Telecommunication Industry standards including the ANSI/EIA/TIA 568 (Telecommunication Cabling Standard), ANSI/EIA/TIA 569 (Pathways and Spaces), ANSI/EIA/TIA 607-B (Bonding and Grounding), and the ANSI/EIA/TIA 942 (Standard for Data Centers); as well as federal, state, and local codes.

1.03 CABLE DESIGN

A. If the building will connect to our Voice over IP phone system (ShoreTel), then the default Configuration for each workstation outlet shall be 2 data connections. The data connections shall be Category 6 rated. All Category 6 cables shall terminate in the telecommunications room on patch panels. The Category 6 cables and connectors shall be 'White' in, color. The following locations shall be included in every project. See Communications Plans for quantities and locations.

1. per workstation (VOIP) / 3 per workstation (Traditional Voice) 2 per copier/fax location
2. 1 per WiFi location
3. 1 per Kronos / Time Clock location
4. 1 per Camera Location
5. 1 per KP – Keypad Location
6. per Wireless Antenna Exterior (Outdoor Rated Shielded cable)

B. If the building supports a traditional voice system, then the default configuration for each workstation outlet shall be one (2) data connection and one (1) traditional voice connection. All cabling and connections shall be same as above.

C. Backbone cables supporting the traditional voice solutions shall be a high-pair Category 3 cable, which shall be terminated in the telecommunications rooms on 110-blocks.

D. Backbone cables supporting data applications shall use Multimode or Single Mode fiber (specified on drawings). The selection of fiber shall depend on the actual distance and network performance requirements. The default fiber optic connector for Multimode and Single mode cabling is the 'LC' connector.

1.04 CABLE PERFORMANCE

All data and voice drops shall be tested to the Category 6 permanent-link performance specifications. All fiber drops shall be tested to the performance standards defined in ANSI/EIA/'TIA 802.3z.

1.05 CONDITIONED SPACE

All data closets must be air-conditioned space. IDF and MDF spaces should maintain positive air pressure and should be designed for a minimum of one air change per hour. Recommended equipment would be a dedicated mini-split air-conditioner inside of the data closet, the temperature range should be maintained at a range of 65 and 75 degrees F. Alternate Air flow distribution within the IDF and MDF should be accomplished via the use of supply and return ducts, the temperature range should be maintained at a range of 65 and 75 degrees F. Please refer to final construction drawings for details.

1.06 KRONOS CLOCK LOCATIONS

All locations noted by TC (Time Clock / Kronos) require (1) Category 6 cable to each location. The clock will also require a 110 outlet for power. Cable at noted Keypad location may be terminated on RJ45 and left within single gang box with 1’ pigtail, the other end shall be terminated on patch panel. Cable must be terminated on both ends and tested as any other Category 6 cable. The 110 outlet for the clock will need to be at 48” to center. The Category 6 cable will need to be 5” to the Right of the 110 outlet. See Communications Plans or Attachment for more details.

1.07 ACCESS CONTROL

All locations noted by KP (Keypad) require (1) Category 6 cable to each location. Cable at noted Keypad location may be terminated on RJ45 and left within single gang box with 1’ pigtail, the other end shall be terminated on patch panel. Cable must be terminated on both ends and tested as any other Category 6 cable. Keypad height to be 52” to Center of single gang box. If noted in lease documents for contractor to supply hardware, the Access Control System must be Isonas. Detailed parts list must be submitted as part of submittal package for review. See Communications Plans or Attachment for more details.

1.08 VIDEO SURVEILLANCE

All locations noted on plans with the camera symbol require (1) Category 6 cable to each location. Cable at noted camera location may be terminated on RJ45 and left with a 10' coil above ceiling; the other end shall be terminated on patch panel. Cable must be terminated on both ends and tested as any other Category 6 cable. If noted in lease documents for contractor to supply hardware, the Video Surveillance System must be:

1. Cameras – Samsung
2. VMS - OnSSI
3. Edge Recorder – Razberi Technologies Server

Detailed parts list must be submitted as part of submittal package for review. See Communications Plans or Attachment for more details.

1.09 RACKS, CABINETS AND PATHWAYS DESIGN

At least one rack, cabinet or wall mount cabinet shall be securely mounted in each telecommunication space to support the data cabling and network equipment. The fiber optic housing shall be mounted at the top of the rack or cabinet. The data patch panels and cable management will be mounted just below the fiber optic housing. Cable shall enter from the top, and be cleanly dressed. Overhead cabling shall be independently supported, and never laid on ceiling tiles, tied to any conduit, or attached to ceiling supports. Overhead pathways are required for large cable bundles. J-Hooks may be installed to support small cable bundles. All outside plant cables shall be placed in conduit. Each fiber optic cable shall be placed within an inner duct. See Communications Plans or Attachment for more details.

1.10 FIRESTROP AND GROUNDING

Firestops materials shall be installed to re-establish the integrity of each through-wall or through-floor penetration as required by local code. All firestop products shall be installed in accordance with the manufacturer recommendations. All equipment racks, cabinets, and raceway systems shall be bonded and grounded per ANSI/EIA/TIA 607-B

PART 2 – PRODUCTS

2.01 All products shall be installed in compliance with the manufactures instructions. County of Imperial standard equipment, hardware, cable and connectivity products must be the following Approved Manufactures.

1. All Fiber products to be Corning
2. All Structured Cabling to be CommScope (Systimax)
3. All Rack and Wire Management to be Chatsworth Products All Access Control equipment to be Isonas
4. All Electric strikes to be HESS
5. All Cameras to be Samsung

6. All Recorders to be Razberi
7. All VMS software and Licenses to be OnSSI

PART 3 – EXECUTION

3.01 GENERAL:

A. Accessibility and Clearance: Electrical equipment, outlets, junction and pullboxes, shall be installed in accessible locations, avoiding obstructions, preserving headroom, and keeping openings and passageways clear. Minor adjustments in the locations of equipment shall be made where necessary, providing such adjustments do not adversely affect functioning of the equipment.

B. Structural Fittings: Furnish and install the necessary sleeves, inserts, hangers, anchor bolts, and related structural items. Install at proper time.

C. Identification of Circuits and Equipment.
1. Main switchboards, panelboards, circuit breakers, disconnect switches, starters, pushbutton control stations, and other apparatus used for the operation or control of feeder circuits, appliances, air conditioning units, or equipment shall be properly identified by means of descriptive nameplates, permanently attached to equipment.
2. Nameplates shall be engraved laminated phenolic with white letters on black background. Attachment to equipment shall be with escutcheon pins or rivets. Self-adhering or adhesive backed nameplates shall not be used.
3. Cardholders and cards shall be provided for circuit identification in panel boards. Cardholders shall consist of a metal frame retaining a clear plastic cover permanently attached to the inside of panel door. List of circuits shall be typewritten on card. Circuit description shall include name of area and/or connected load.
4. Junction and pull boxes shall have covers stenciled with box number when shown on the drawings, or circuit numbers according to panel schedules. Data shall be lettered in an inconspicuous manner with a color contrasting to finish.

3.02 TESTS:

A. All wiring and connections shall be tested for continuity, short circuits, and proper or improper grounds.

B. Provide cable test results for each data and fiber optic cable.

3.03 CLEANING AND PROTECTION:

A. Protect newly installed equipment until completion of project. Clean, test, and adjust as required for proper performance. Finished surfaces shall be restored to

their original texture and finish. Lighting fixtures shall be cleaned, metal and glass work polished, and lamps wiped clean.

3.04 DOCUMENTATION:

A. As-built drawings are required, which identify the label of each Category 6 jack, telecommunication space locations, work-station outlet locations, cabling pathways, firestop and grounding components.

B. Every installation shall provide a 25-year extended warranty on the horizontal and backbone cabling solutions by the product manufactures. The extended warranty shall include (but not limited to), product, performance, and application guarantees. If hardware is provided all hardware product warranties shall be attached in closeout documentation.

3.05 CONTRACTOR QUALIFICATIONS:

A. Contractor qualifications shall include proven experience, certified staff, multiple customer references, and their ability to offer the extended warranty available by the Approved Product Manufactures that are listed above (See Sec 9).

END OF SECTION

(PAGE INTENTIONALLY LEFT BLANK)

SECTION 28 05 00 - COMMON WORK RESULTS FOR ELECTRONIC SAFETY AND SECURITY

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Sleeves for raceways and cables.
2. Sleeve seals.
3. Grout.
4. Common electronic safety and security installation requirements.

1.2 SUBMITTALS

A. Product Data: For sleeve seals.

PART 2 - PRODUCTS

2.1 SLEEVES FOR RACEWAYS AND CABLES

A. Steel Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, galvanized steel, plain ends.

B. Cast-Iron Pipe Sleeves: Cast or fabricated "wall pipe," equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop, unless otherwise indicated.

C. Sleeves for Rectangular Openings: Galvanized sheet steel.

1. Minimum Metal Thickness:

a. For sleeve cross-section rectangle perimeter less than 50 inches and no side more than 16 inches, thickness shall be 0.052 inch.
b. For sleeve cross-section rectangle perimeter equal to, or more than, 50 inches and 1 or more sides equal to, or more than, 16 inches, thickness shall be 0.138 inch.

2.2 SLEEVE SEALS

A. Description: Modular sealing device, designed for field assembly, to fill annular space between sleeve and raceway or cable.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
2. Basis-of-Design Product: Subject to compliance with requirements, provide products by one of the following or comparable manufacturers:

    a. Advance Products & Systems, Inc.
    b. Calpico, Inc.
    c. Metraflex Co.
    d. Pipeline Seal and Insulator, Inc.

3. Sealing Elements: EPDM or NBR interlocking links shaped to fit surface of cable or conduit. Include type and number required for material and size of raceway or cable.
4. Pressure Plates: Plastic, Carbon steel or Stainless steel. Include two for each sealing element.
5. Connecting Bolts and Nuts: Carbon steel with corrosion-resistant coating of length required to secure pressure plates to sealing elements. Include one for each sealing element.

2.3 GROUT

A. Nonmetallic, Shrinkage-Resistant Grout: ASTM C 1107, factory-packaged, nonmetallic aggregate grout, noncorrosive, non-staining, mixed with water to consistency suitable for application and a 30-minute working time.

PART 3 - EXECUTION

3.1 COMMON REQUIREMENTS FOR ELECTRONIC SAFETY AND SECURITY INSTALLATION

A. Comply with NECA 1.

B. Measure indicated mounting heights to bottom of unit for suspended items and to center of unit for wall-mounting items.

C. Headroom Maintenance: If mounting heights or other location criteria are not indicated, arrange and install components and equipment to provide maximum possible headroom consistent with these requirements.

D. Equipment: Install to facilitate service, maintenance, and repair or replacement of components of both electronic safety and security equipment and other nearby installations. Connect in such a way as to facilitate future disconnecting with minimum interference with other items in the vicinity.

E. Right of Way: Give to piping systems installed at a required slope.

3.2 SLEEVE INSTALLATION FOR ELECTRONIC SAFETY AND SECURITY PENETRATIONS

A. Electronic safety and security penetrations occur when raceways, pathways, cables, wireways, or cable trays penetrate concrete slabs, concrete or masonry walls, or fire-rated floor and wall assemblies.

B. Concrete Slabs and Walls: Install sleeves for penetrations unless core-drilled holes or formed openings are used. Install sleeves during erection of slabs and walls.

C. Use pipe sleeves unless penetration arrangement requires rectangular sleeved opening.

D. Fire-Rated Assemblies: Install sleeves for penetrations of fire-rated floor and wall assemblies unless openings compatible with firestop system used are fabricated during construction of floor or wall.

E. Cut sleeves to length for mounting flush with both surfaces of walls.

F. Extend sleeves installed in floors 2 inches above finished floor level.

G. Size pipe sleeves to provide 1/4-inch annular clear space between sleeve and raceway or cable, unless indicated otherwise.

H. Seal space outside of sleeves with grout for penetrations of concrete and masonry

1. Promptly pack grout solidly between sleeve and wall so no voids remain. Tool exposed surfaces smooth; protect grout while curing.

I. Interior Penetrations of Non-Fire-Rated Walls and Floors: Seal annular space between sleeve and raceway or cable, using joint sealant appropriate for size, depth, and location of joint. Comply with requirements in Division 07 Section "Joint Sealants.".

J. Fire-Rated-Assembly Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at raceway and cable penetrations. Install sleeves and seal raceway and cable penetration sleeves with firestop materials. Comply with requirements in Division 07 Section "Penetration Firestopping."

K. Roof-Penetration Sleeves: Seal penetration of individual raceways and cables with flexible boot-type flashing units applied in coordination with roofing work.

L. Aboveground, Exterior-Wall Penetrations: Seal penetrations using steel pipe sleeves and mechanical sleeve seals. Select sleeve size to allow for 1-inch annular clear space between pipe and sleeve for installing mechanical sleeve seals.

M. Underground, Exterior-Wall Penetrations: Install cast-iron pipe sleeves. Size sleeves to allow for 1-inch annular clear space between raceway or cable and sleeve for installing mechanical sleeve seals.

3.3 SLEEVE-SEAL INSTALLATION

A. Install to seal exterior wall penetrations.

B. Use type and number of sealing elements recommended by manufacturer for raceway or cable material and size. Position raceway or cable in center of sleeve. Assemble mechanical sleeve seals and install in annular space between raceway or cable and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

3.4 FIRESTOPPING

A. Apply firestopping to penetrations of fire-rated floor and wall assemblies for electronic safety and security installations to restore original fire-resistance rating of assembly. Firestopping materials and installation requirements are specified in Division 07 Section "Penetration Firestopping."

END OF SECTION 280500

SECTION 28 05 13 - CONDUCTORS AND CABLES FOR ELECTRONIC SAFETY AND SECURITY

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. UTP cabling.
2. Multimode optical fiber cabling.
3. Coaxial cabling.
4. RS-232 cabling.
5. RS-485 cabling.
6. Low-voltage control cabling.
7. Control-circuit conductors.
8. Fire alarm wire and cable.
9. Identification products.

1.2 DEFINITIONS

A. BICSI: Building Industry Consulting Service International.

B. EMI: Electromagnetic interference.

C. IDC: Insulation displacement connector.

D. Open Cabling: Passing telecommunications cabling through open space (e.g., between the studs of a wall cavity).

E. RCDD: Registered Communications Distribution Designer.

1.3 PERFORMANCE REQUIREMENTS

A. Seismic Performance: Pathways shall withstand the effects of earthquake motions determined according to ASCE/SEI 7.

1. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified and the unit will be fully operational after the seismic event."

1.4 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings: Cable tray layout, showing cable tray route to scale, with relationship between the tray and adjacent structural, electrical, and mechanical elements.

C. Qualification Data: For qualified layout technician, installation supervisor, and field inspector.

D. Seismic Qualification Certificates: For pathways, accessories, and components, from manufacturer.

E. Source quality-control reports.

F. Field quality-control reports.

G. Operation and maintenance data.

1.5 QUALITY ASSURANCE

A. Testing Agency Qualifications: An NRTL.

1. Testing Agency's Field Supervisor: Currently certified by BICSI as an RCDD to supervise on-site testing.

B. Surface-Burning Characteristics: As determined by testing identical products according to ASTM E 84 by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

1. Flame-Spread Index: 25 or less.
2. Smoke-Developed Index: 50 or less.

C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Test cables upon receipt at Project site.

1. Test optical fiber cable to determine the continuity of the strand end to end. Use optical-fiber flashlight or optical loss test set.
2. Test optical fiber cable on reels. Use an optical time domain reflectometer to verify the cable length and locate cable defects, splices, and connector; include

the loss value of each. Retain test data and include the record in maintenance data.

3. Test each pair of UTP cable for open and short circuits.

1.7 PROJECT CONDITIONS

A. Do not install conductors and cables that are wet, moisture damaged, or mold damaged.

1. Indications that wire and cables are wet or moisture damaged include, but are not limited to, discoloration and sagging of factory packing materials.

B. Environmental Limitations: Do not deliver or install UTP, optical fiber, and coaxial cables and connecting materials until wet work in spaces is complete and dry, and temporary HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.

PART 2 - PRODUCTS

2.1 PATHWAYS

A. Support of Open Cabling: NRTL labeled for support of Category 5e or Category 6 cabling, designed to prevent degradation of cable performance and pinch points that could damage cable.

B. Cable Trays:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

a. Allied Tube & Conduit; a business unit of Tyco Electrical & Metal Products.
b. Cablofil.
c. Cooper B-Line, Inc.
d. GS Metals Corp.
e. Snaketray; Cable Management Solutions, Inc.

2. Cable Tray Materials: Metal, suitable for indoors, and protected against corrosion by electroplated zinc galvanizing, complying with ASTM B 633, Type 1, not less than 0.000472 inch thick hot-dip galvanizing, complying with ASTM A 123/A 123M Grade 0.55, not less than 0.002165 inch thick].

a. Basket Cable Trays: 6 inches wide and 2 inches deep. Wire mesh spacing shall not exceed 2 by 4 inches.

C. Conduit and Boxes: Comply with requirements in Division 26 Section "Raceway and Boxes for Electrical Systems."

1. Outlet boxes shall be no smaller than 2 inches wide, 3 inches high, and 2-1/2 inches deep.

2.2 BACKBOARDS

A. Backboards: Plywood, fire-retardant treated, 3/4 by 48 by 96 inches. Comply with requirements for plywood backing panels in Division 06 Section "Rough Carpentry".

2.3 UTP CABLE

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. ADC.
2. AMP Netconnect; a brand of Tyco Electronics Corporation.
3. Belden CDT Networking Division/NORDX.
4. Belden Inc.
5. Berk-Tek; a Nexans company.
6. CommScope, Inc.
7. Draka Cableteq USA.
8. Genesis Cable Products; Honeywell International, Inc.
9. Mohawk; a division of Belden.
10. Superior Essex Inc.
11. SYSTIMAX Solutions; a CommScope, Inc. brand.
12. 3M; Communication Markets Division.

B. Description: 100-ohm, 4-pair UTP, covered with a blue thermoplastic jacket.

1. Comply with ICEA S-90-661 for mechanical properties.
2. Comply with TIA/EIA-568-B.1 for performance specifications.
3. Comply with TIA/EIA-568-B.2, Category 5e or Category 6.
4. Listed and labeled by an NRTL acceptable to authorities having jurisdiction as complying with UL 444 and NFPA 70 for the following types:

a. Communications, General Purpose: Type CM or CMG; or MPP, CMP, MPR, CMR, MP, or MPG.
b. Communications, Plenum Rated: Type CMP or MPP, complying with NFPA 262.

c. Communications, Riser Rated: Type CMR; or MPP, CMP, or MPR, complying with UL 1666.
d. Communications, Limited Purpose: Type CMX; or MPP, CMP, MPR, CMR, MP, MPG, CM, or CMG.
e. Multipurpose: Type MP or MPG; or MPP or MPR.
f. Multipurpose, Plenum Rated: Type MPP, complying with NFPA 262.
g. Multipurpose, Riser Rated: Type MPR or MPP, complying with UL 1666.

2.4 UTP CABLE HARDWARE

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. ADC.
2. American Technology Systems Industries, Inc.
3. AMP Netconnect; a brand of Tyco Electronics Corporation.
4. Belden CDT Networking Division/NORDX.
5. Dynacom Corporation.
6. Hubbell Incorporated; Hubbell Premise Wiring.
7. Leviton Voice & Data Division.
8. Molex Premise Networks; a division of Molex, Inc.
9. PANDUIT CORP.
10. Siemon.

B. UTP Cable Connecting Hardware: IDC type, using modules designed for punch-down caps or tools. Cables shall be terminated with connecting hardware of the same category or higher.

C. Connecting Blocks: 110-style for Category 5e, 110-style for Category 6, or 66-style for Category 5e. Provide blocks for the number of cables terminated on the block, plus 25 percent spare. Integral with connector bodies, including plugs and jacks where indicated.

2.5 OPTICAL FIBER CABLE

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. AMP Netconnect; a brand of Tyco Electronics Corporation.
2. Belden CDT Networking Division/NORDX.
3. Berk-Tek; a Nexans company.
4. CommScope, Inc.
5. Corning Incorporated; Corning Cable Systems.

6. CSI Technologies Inc.
7. General Cable Technologies Corporation.
8. Mohawk; a division of Belden.
9. Superior Essex Inc.
10. SYSTIMAX Solutions; a CommScope, Inc. brand.
11. 3M; Communication Markets Division.

B. Description: Multimode, micrometer, 24-fiber, nonconductive, tight buffer, optical fiber cable.

1. Comply with ICEA S-83-596 for mechanical properties.
2. Comply with TIA/EIA-568-B.3 for performance specifications.
3. Comply with TIA-492AAAB and TIA-492AAAA-A for detailed specifications.
4. Listed and labeled by an NRTL acceptable to authorities having jurisdiction as complying with UL 444, UL 1651, and NFPA 70 for the following types:

    a. General Purpose, Nonconductive: Type OFN or OFNG**,** or OFNR, OFNP.
    b. Plenum Rated, Nonconductive: Type OFNP, complying with NFPA 262.
    c. Riser Rated, Nonconductive: Type OFNR or OFNP, complying with UL 1666.

5. Maximum Attenuation: 3.50 dB/km at 850 nm; 1.5 dB/km at 1300 nm.
6. Minimum Modal Bandwidth: 160 MHz-km at 850 nm; 500 MHz-km at 1300 nm.

C. Jacket:

1. Jacket Color: Aqua for 50/125-micrometer cable or Orange for 62.5/125-micrometer cable.
2. Cable cordage jacket, fiber, unit, and group color shall be according to TIA-598-C.
3. Imprinted with fiber count, fiber type, and aggregate length at regular intervals not to exceed 40 inches.

2.6 OPTICAL FIBER CABLE HARDWARE

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. ADC.
2. American Technology Systems Industries, Inc.
3. Belden CDT Networking Division/NORDX.
4. Berk-Tek; a Nexans company.
5. Corning Incorporated; Corning Cable Systems.
6. CSI Technologies Inc.
7. Dynacom Corporation.

8. Hubbell Incorporated; Hubbell Premise Wiring.
9. Molex Premise Networks; a division of Molex, Inc.
10. Siemon.

B. Cable Connecting Hardware: Meet the Optical Fiber Connector Intermateability Standards (FOCIS) specifications of TIA-604-2-B, TIA-604-3-B, and TIA/EIA-604-12. Comply with TIA/EIA-568-B.3.

1. Quick-connect, simplex and duplex connectors. Insertion loss not more than 0.75 dB.
2. Type SFF connectors may be used in termination racks, panels, and equipment packages.

2.7 COAXIAL CABLE

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Alpha Wire Company.
2. Belden CDT Networking Division/NORDX.
3. Coleman Cable, Inc.
4. CommScope, Inc.
5. Draka Cableteq USA.

B. General Coaxial Cable Requirements: Broadband type, recommended by cable manufacturer specifically for broadband data transmission applications. Coaxial cable and accessories shall have 75-ohm nominal impedance with a return loss of 20 dB maximum from 7 to 806 MHz.

C. RG-11/U: NFPA 70, Type CATV.

1. No. 14 AWG, solid, copper-covered steel conductor.
2. Gas-injected, foam-PE insulation.
3. Double shielded with 100 percent aluminum polyester tape and 60 percent aluminum braid.
4. Jacketed with sunlight-resistant, black PVC or PE.
5. Suitable for outdoor installations in ambient temperatures ranging from minus 40 to plus 85 deg C.

D. RG-6/U: NFPA 70, Type CATV or CM.

1. No. 16 AWG, solid, copper-covered steel conductor; gas-injected, foam-PE insulation.
2. Double shielded with 100 percent aluminum-foil shield and 60 percent aluminum braid.

3. Jacketed with black PVC or PE.
4. Suitable for indoor installations.

E. NFPA and UL Compliance: CATV Cable, Type CATV, or CATVP or CATVR shall be listed and labeled by an NRTL acceptable to authorities having jurisdiction as complying with UL 1655, and with NFPA 70 "Radio and Television Equipment" and "Community Antenna Television and Radio Distribution" Articles.

2.8 COAXIAL CABLE HARDWARE

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Emerson Network Power Connectivity Solutions; AIM Electronics brand.
2. Leviton Voice & Data Division.
3. Siemon.

B. Coaxial-Cable Connectors: Type BNC, 75 ohms.

2.9 RS-232 CABLE

A. Standard Cable: NFPA 70, Type CM.

1. Paired, 2 pairs, No. 22 AWG, stranded (7x30) tinned copper conductors.
2. Polypropylene insulation.
3. Individual aluminum foil-polyester tape shielded pairs with 100 percent shield coverage.
4. PVC jacket.
5. Pairs are cabled on common axis with No. 24 AWG, stranded (7x32) tinned copper drain wire.
6. Flame Resistance: Comply with UL 1581.

B. Plenum-Rated Cable: NFPA 70, Type CMP.

1. Paired, 2 pairs, No. 22 AWG, stranded (7x30) tinned copper conductors.
2. Plastic insulation.
3. Individual aluminum foil-polyester tape shielded pairs with 100 percent shield coverage.
4. Plastic jacket.
5. Pairs are cabled on common axis with No. 24 AWG, stranded (7x32) tinned copper drain wire.
6. Flame Resistance: Comply with NFPA 262.

2.10 RS-485 CABLE

A. Standard Cable: NFPA 70, Type CM or CMG.

1. Paired, 2 pairs, twisted, No. 22 AWG, stranded (7x30) tinned copper conductors.
2. PVC insulation.
3. Unshielded.
4. PVC jacket.
5. Flame Resistance: Comply with UL 1581.

B. Plenum-Rated Cable: NFPA 70, Type CMP.

1. Paired, 2 pairs, No. 22 AWG, stranded (7x30) tinned copper conductors.
2. Fluorinated ethylene propylene insulation.
3. Unshielded.
4. Fluorinated ethylene propylene jacket.
5. Flame Resistance: NFPA 262, Flame Test.

2.11 LOW-VOLTAGE CONTROL CABLE

A. Paired Cable: NFPA 70, Type CMG.

1. 1 pair, twisted, No. 16 AWG, stranded (19x29) tinned copper conductors.
2. PVC insulation.
3. Unshielded.
4. PVC jacket.
5. Flame Resistance: Comply with UL 1581.

B. Plenum-Rated, Paired Cable: NFPA 70, Type CMP.

1. 1 pair, twisted, No. 16 AWG, stranded (19x29) tinned copper conductors.
2. PVC insulation.
3. Unshielded.
4. PVC jacket.
5. Flame Resistance: Comply with NFPA 262.

2.12 CONTROL-CIRCUIT CONDUCTORS

A. Class 1 Control Circuits: Stranded copper, Type THHN-THWN, complying with UL 83, in raceway or Type XHHN, complying with UL 44, in raceway as determined by life safety designer.

B. Class 2 Control Circuits: Stranded copper, Type THHN-THWN, complying with UL 83, in raceway, power-limited cable, complying with UL 83, concealed in building

finishes, power-limited tray cable, complying with UL 83, in cable tray, Type XHHN, complying with UL 44, in raceway as determined by life safety designer.

C. Class 3 Remote-Control and Signal Circuits: Stranded copper, Type TW or TF, complying with UL 83.

2.13 FIRE ALARM WIRE AND CABLE

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Comtran Corporation.
2. Draka Cableteq USA.
3. Genesis Cable Products; Honeywell International, Inc.
4. Rockbestos-Suprenant Cable Corp.
5. West Penn Wire; a brand of Belden Inc.

B. General Wire and Cable Requirements: NRTL listed and labeled as complying with NFPA 70, Article 760.

C. Signaling Line Circuits: Twisted, shielded pair, not less than No. 18 AWG size as recommended by system manufacturer.

1. Circuit Integrity Cable: Twisted shielded pair, NFPA 70, Article 760, Classification CI, for power-limited fire alarm signal service Type FPL. NRTL listed and labeled as complying with UL 1424 and UL 2196 for a 2-hour rating.

D. Non-Power-Limited Circuits: Solid-copper conductors with 600-V rated, 75 deg C, color-coded insulation.

1. Low-Voltage Circuits: No. 16 AWG, minimum.
2. Line-Voltage Circuits: No. 12 AWG, minimum.
3. Multiconductor Armored Cable: NFPA 70, Type MC, copper conductors, Type TFN/THHN conductor insulation, copper drain wire, copper armor with outer jacket with red identifier stripe, NTRL listed for fire alarm and cable tray installation, plenum rated, and complying with requirements in UL 2196 for a 2-hour rating.

2.14 IDENTIFICATION PRODUCTS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Brady Corporation.
2. HellermannTyton.
3. Kroy LLC.
4. PANDUIT CORP.

B. Comply with UL 969 for a system of labeling materials, including label stocks, laminating adhesives, and inks used by label printers.

C. Comply with requirements in Division 26 Section "Identification for Electrical Systems."

2.15 SOURCE QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified testing agency to evaluate cables.

B. Factory test UTP and optical fiber cables on reels according to TIA/EIA-568-B.1.

C. Factory test UTP cables according to TIA/EIA-568-B.2.

D. Factory test multimode optical fiber cables according to TIA-526-14-A and TIA/EIA-568-B.3.

E. Factory sweep test coaxial cables at frequencies from 5 MHz to 1 GHz. Sweep test shall test the frequency response, or attenuation over frequency, of a cable by generating a voltage whose frequency is varied through the specified frequency range and graphing the results.

F. Cable will be considered defective if it does not pass tests and inspections.

G. Prepare test and inspection reports.

PART 3 - EXECUTION

3.1 INSTALLATION OF PATHWAYS

A. Cable Trays: Comply with NEMA VE 2 and TIA-569-B.

B. Comply with TIA-569-B for pull-box sizing and length of conduit and number of bends between pull points.

C. Comply with requirements in Division 26 Section "Raceway and Boxes for Electrical Systems." for installation of conduits and wireways.

D. Install manufactured conduit sweeps and long-radius elbows whenever possible.

E. Pathway Installation in Equipment Rooms:

1. Position conduit ends adjacent to a corner on backboard where a single piece of plywood is installed or in the corner of room where multiple sheets of plywood are installed around perimeter walls of room.
2. Install cable trays to route cables if conduits cannot be located in these positions.
3. Secure conduits to backboard when entering room from overhead.
4. Extend conduits 3 inches above finished floor.
5. Install metal conduits with grounding bushings and connect with grounding conductor to grounding system.

F. Backboards: Install backboards with 96-inch dimension vertical. Butt adjacent sheets tightly, and form smooth gap-free corners and joints.

3.2 INSTALLATION OF HANGERS AND SUPPORTS

A. Comply with requirements in Division 26 Section "Hangers and Supports for Electrical Systems." for installation of supports for pathways, conductors and cables.

3.3 WIRING METHOD

A. Install wiring in metal raceways and wireways. Conceal raceway except in unfinished spaces and as indicated. Minimum conduit size shall be 3/4 inch. Control and data transmission wiring shall not share conduit with other building wiring systems.

B. Install wiring in raceways except in accessible indoor ceiling spaces and in interior hollow gypsum board partitions where cable may be used. Conceal raceways and wiring except in unfinished spaces and as indicated. Minimum conduit size shall be 3/4 inch. Control and data transmission wiring shall not share conduit with other building wiring systems.

C. Install cable, concealed in accessible ceilings, walls, and floors when possible.

D. Wiring within Enclosures: Bundle, lace, and train conductors to terminal points. Use lacing bars and distribution spools. Separate power-limited and non-power-limited conductors as recommended in writing by manufacturer. Install conductors parallel with or at right angles to sides and back of enclosure. Connect conductors that are terminated, spliced, or interrupted in any enclosure associated with intrusion system to terminal blocks. Mark each terminal according to system's wiring diagrams. Make all connections with approved crimp-on terminal spade lugs, pressure-type terminal blocks, or plug connectors.

3.4 INSTALLATION OF CONDUCTORS AND CABLES

A. Comply with NECA 1.

B. Conductors: Size according to system manufacturer's written instructions unless otherwise indicated.

C. General Requirements for Cabling:

1. Comply with TIA/EIA-568-B.1.
2. Comply with BICSI ITSIM, Ch. 6, "Cable Termination Practices."
3. Terminate all conductors; no cable shall contain unterminated elements. Make terminations only at indicated outlets, terminals, and cross-connect and patch panels.
4. Cables may not be spliced. Secure and support cables at intervals not exceeding 30 inches and not more than 6 inches from cabinets, boxes, fittings, outlets, racks, frames, and terminals.
5. Bundle, lace, and train conductors to terminal points without exceeding manufacturer's limitations on bending radii, but not less than radii specified in BICSI ITSIM, "Cabling Termination Practices" Chapter. Install lacing bars and distribution spools.
6. Do not install bruised, kinked, scored, deformed, or abraded cable. Do not splice cable between termination, tap, or junction points. Remove and discard cable if damaged during installation and replace it with new cable.
7. Cold-Weather Installation: Bring cable to room temperature before dereeling. Heat lamps shall not be used for heating.
8. Pulling Cable: Comply with BICSI ITSIM, Ch. 4, "Pulling Cable." Monitor cable pull tensions.

D. UTP Cable Installation: Install using techniques, practices, and methods that are consistent with **Category 5e** or **Category 6** rating of components and that ensure **Category 5e or Category 6** performance of completed and linked signal paths, end to end.

1. Comply with TIA/EIA-568-B.2.
2. Install 110-style IDC termination hardware unless otherwise indicated.
3. Do not untwist UTP cables more than 1/2 inch from the point of termination to maintain cable geometry.

E. Optical Fiber Cable Installation:

1. Comply with TIA/EIA-568-B.3.
2. Cable shall be terminated on connecting hardware that is rack or cabinet mounted.

F. Outdoor Coaxial Cable Installation:

1. Install outdoor connections in enclosures complying with NEMA 250, Type 4X. Install corrosion-resistant connectors with properly designed O-rings to keep out moisture.
2. Attach antenna lead-in cable to support structure at intervals not exceeding 36 inches.

G. Open-Cable Installation:

1. Install cabling with horizontal and vertical cable guides in telecommunications spaces with terminating hardware and interconnection equipment.
2. Suspend copper cable not in a wireway or pathway a minimum of 8 inches above ceilings by cable supports not more than 60 inches apart.
3. Cable shall not be run through structural members or in contact with pipes, ducts, or other potentially damaging items.

H. Separation from EMI Sources:

1. Comply with BICSI TDMM and TIA-569-B recommendations for separating unshielded copper voice and data communication cable from potential EMI sources, including electrical power lines and equipment.
2. Separation between open communications cables or cables in nonmetallic raceways and unshielded power conductors and electrical equipment shall be as follows:

    a. Electrical Equipment Rating Less Than 2 kVA: A minimum of 5 inches.
    b. Electrical Equipment Rating between 2 and 5 kVA: A minimum of 12 inches.
    c. Electrical Equipment Rating More Than 5 kVA: A minimum of 24 inches.

3. Separation between communications cables in grounded metallic raceways and unshielded power lines or electrical equipment shall be as follows:

    a. Electrical Equipment Rating Less Than 2 kVA: A minimum of 2-1/2 inches.
    b. Electrical Equipment Rating between 2 and 5 kVA: A minimum of 6 inches.
    c. Electrical Equipment Rating More Than 5 kVA: A minimum of 12 inches.

4. Separation between communications cables in grounded metallic raceways and power lines and electrical equipment located in grounded metallic conduits or enclosures shall be as follows:

    a. Electrical Equipment Rating Less Than 2 kVA: No requirement.
    b. Electrical Equipment Rating between 2 and 5 kVA: A minimum of 3 inches.
    c. Electrical Equipment Rating More Than 5 kVA: A minimum of 6 inches.

5. Separation between Cables and Electrical Motors and Transformers, 5 kVA or HP and Larger: A minimum of 48 inches.
6. Separation between Cables and Fluorescent Fixtures: A minimum of 5 inches.

3.5 FIRE ALARM WIRING INSTALLATION

A. Comply with NECA 1 and NFPA 72.

B. Wiring Method: Install wiring in metal raceway according to Division 26 Section "Raceway and Boxes for Electrical Systems."

1. Install plenum cable in environmental air spaces, including plenum ceilings.
2. Fire alarm circuits and equipment control wiring associated with the fire alarm system shall be installed in a dedicated raceway system. This system shall not be used for any other wire or cable.

C. Wiring Method:

1. Cables and raceways used for fire alarm circuits, and equipment control wiring associated with the fire alarm system, may not contain any other wire or cable.
2. Fire-Rated Cables: Use of 2-hour, fire-rated fire alarm cables, NFPA 70.
3. Signaling Line Circuits: Power-limited fire alarm cables may be installed in the same cable or raceway as signaling line circuits as permitted by code requirements.

D. Wiring within Enclosures: Separate power-limited and non-power-limited conductors as recommended by manufacturer. Install conductors parallel with or at right angles to sides and back of the enclosure. Bundle, lace, and train conductors to terminal points with no excess. Connect conductors that are terminated, spliced, or interrupted in any enclosure associated with the fire alarm system to terminal blocks. Mark each terminal according to the system's wiring diagrams. Make all connections with approved crimp-on terminal spade lugs, pressure-type terminal blocks, or plug connectors.

E. Cable Taps: Use numbered terminal strips in junction, pull, and outlet boxes, cabinets, or equipment enclosures where circuit connections are made.

F. Color-Coding: Color-code fire alarm conductors differently from the normal building power wiring. Use one color-code for alarm circuit wiring and another for supervisory circuits. Color-code audible alarm-indicating circuits differently from alarm-initiating circuits. Use different colors for visible alarm-indicating devices. Paint fire alarm system junction boxes and covers red.

G. Risers: Install at least two vertical cable risers to serve the fire alarm system. Separate risers in close proximity to each other with a minimum one-hour-rated wall, so the loss of one riser does not prevent the receipt or transmission of signals from other floors or zones.

H. Wiring to Remote Alarm Transmitting Device: 1-inch conduit between the fire alarm control panel and the transmitter. Install number of conductors and electrical supervision for connecting wiring as needed to suit monitoring function.

3.6 POWER AND CONTROL-CIRCUIT CONDUCTORS

A. 120-V Power Wiring: Install according to Division 26 Section "Low-Voltage Electrical Power Conductors and Cables" unless otherwise indicated.

B. Minimum Conductor Sizes:

1. Class 1 remote-control and signal circuits, No. 14 AWG.
2. Class 2 low-energy, remote-control and signal circuits, No. 16 AWG.
3. Class 3 low-energy, remote-control, alarm and signal circuits, No. 12 AWG.

3.7 CONNECTIONS

A. Comply with requirements in Division 28 Section "Perimeter Security Systems" for connecting, terminating, and identifying wires and cables.

B. Comply with requirements in Division 28 Section "Intrusion Detection" for connecting, terminating, and identifying wires and cables.

C. Comply with requirements in Division 28 Section "Access Control" for connecting, terminating, and identifying wires and cables.

D. Comply with requirements in Division 28 Section "Video Surveillance" for connecting, terminating, and identifying wires and cables.

E. Comply with requirements in Division 28 Section "PLC Electronic Detention Monitoring and Control Systems" for connecting, terminating, and identifying wires and cables.

F. Comply with requirements in Division 28 Section "Digital Addressable Fire-Alarm System" for connecting, terminating, and identifying wires and cables.

G. Comply with requirements in Division 28 Section "Refrigerant Detection and Alarm" for connecting, terminating, and identifying wires and cables.

3.8 FIRESTOPPING

A. Comply with requirements in Division 07 Section "Penetration Firestopping."

B. Comply with TIA-569-B, "Firestopping" Annex A.

C. Comply with BICSI TDMM, "Firestopping Systems" Article.

3.9 GROUNDING

A. For communications wiring, comply with ANSI-J-STD-607-A and with BICSI TDMM, "Grounding, Bonding, and Electrical Protection" Chapter.

B. For low-voltage wiring and cabling, comply with requirements in Division 26 Section "Grounding and Bonding for Electrical Systems."

3.10 IDENTIFICATION

A. Identify system components, wiring, and cabling complying with TIA/EIA-606-A. Comply with requirements for identification specified in Division 26 Section "Identification for Electrical Systems."

3.11 FIELD QUALITY CONTROL

A. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.

B. Perform tests and inspections.

C. Tests and Inspections:

1. Visually inspect UTP and optical fiber cable jacket materials for NRTL certification markings. Inspect cabling terminations to confirm color-coding for pin assignments, and inspect cabling connections to confirm compliance with TIA/EIA-568-B.1.
2. Visually inspect cable placement, cable termination, grounding and bonding, equipment and patch cords, and labeling of all components.
3. Test UTP cabling for DC loop resistance, shorts, opens, intermittent faults, and polarity between conductors. Test operation of shorting bars in connection blocks. Test cables after termination but not cross connection.

    a. Test instruments shall meet or exceed applicable requirements in TIA/EIA-568-B.2. Perform tests with a tester that complies with performance requirements in "Test Instruments (Normative)" Annex, complying with measurement accuracy specified in "Measurement Accuracy (Informative)" Annex. Use only test cords and adapters that are qualified by test equipment manufacturer for channel or link test configuration.

4. Optical Fiber Cable Tests:

a. Test instruments shall meet or exceed applicable requirements in TIA/EIA-568-B.1. Use only test cords and adapters that are qualified by test equipment manufacturer for channel or link test configuration.
b. Link End-to-End Attenuation Tests:

1) Multimode Link Measurements: Test at 850 or 1300 nm in 1 direction according to TIA-526-14-A, Method B, One Reference Jumper.
2) Attenuation test results for links shall be less than 2.0 dB. Attenuation test results shall be less than that calculated according to equation in TIA/EIA-568-B.1.

5. Coaxial Cable Tests: Comply with requirements in Division 27 Section "Master Antenna Television System."

D. Document data for each measurement. Print data for submittals in a summary report that is formatted using Table 10.1 in BICSI TDMM as a guide, or transfer the data from the instrument to the computer, save as text files, print, and submit.

E. End-to-end cabling will be considered defective if it does not pass tests and inspections.

F. Prepare test and inspection reports.

END OF SECTION 280513

SECTION 28 31 11 - DIGITAL, ADDRESSABLE FIRE-ALARM SYSTEM

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Fire-alarm control unit.
2. Manual fire-alarm boxes.
3. System smoke detectors.
4. Non-system smoke detectors.
5. Heat detectors.
6. Notification appliances.
7. Magnetic door holders.
8. Remote annunciator.
9. Addressable interface device.
10. Digital alarm communicator transmitter.

1.2 SYSTEM DESCRIPTION

A. Noncoded, addressable system, with multiplexed signal transmission, dedicated to fire-alarm service only.

1.3 PERFORMANCE REQUIREMENTS

A. Seismic Performance: Fire-alarm control unit and raceways shall withstand the effects of earthquake motions determined according to SEI/ASCE 7.

1. The term "withstand" means "the unit will remain in place without separation of any parts from the device when subjected to the seismic forces specified and the unit will be fully operational after the seismic event."

1.4 SUBMITTALS

A. General Submittal Requirements:

1. Submittals shall be approved by authorities having jurisdiction prior to submitting them to Architect.
2. Shop Drawings shall be prepared by persons with the following qualifications:

a. Trained and certified by manufacturer in fire-alarm system design.

b. NICET-certified fire-alarm technician, Level IV minimum.

B. Product Data: For each type of product indicated.

C. Shop Drawings: For fire-alarm system. Include plans, elevations, sections, details, and attachments to other work.

1. Comply with recommendations in the "Documentation" Section of the "Fundamentals of Fire Alarm Systems" Chapter in NFPA 72.
2. Include voltage drop calculations for notification appliance circuits.
3. Include battery-size calculations.
4. Include performance parameters and installation details for each detector, verifying that each detector is listed for complete range of air velocity, temperature, and humidity possible when air-handling system is operating.
5. Include plans, sections, and elevations of heating, ventilating, and air-conditioning ducts, drawn to scale and coordinating installation of duct smoke detectors and access to them. Show critical dimensions that relate to placement and support of sampling tubes, detector housing, and remote status and alarm indicators. Locate detectors according to manufacturer's written recommendations.
6. Include floor plans to indicate final outlet locations showing address of each addressable device. Show size and route of cable and conduits.

D. Delegated-Design Submittal: For smoke and heat detectors indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1. Drawings showing the location of each smoke and heat detector, ratings of each, and installation details as needed to comply with listing conditions of the detector.
2. Design Calculations: Calculate requirements for selecting the spacing and sensitivity of detection, complying with NFPA 72.

E. Qualification Data: For qualified Installer.

F. Seismic Qualification Certificates: For fire-alarm control unit, accessories, and components, from manufacturer.

G. Field quality-control reports.

H. Operation and Maintenance Data: For fire-alarm systems and components to include in emergency, operation, and maintenance manuals. In addition to items specified in Division 01 Section "Operation and Maintenance Data," include the following:

1. Comply with the "Records" Section of the "Inspection, Testing and Maintenance" Chapter in NFPA 72.

2. Provide "Record of Completion Documents" according to NFPA 72 article "Permanent Records" in the "Records" Section of the "Inspection, Testing and Maintenance" Chapter.
3. Record copy of site-specific software.
4. Provide "Maintenance, Inspection and Testing Records" according to NFPA 72 article of the same name and include the following:

    a. Frequency of testing of installed components.
    b. Frequency of inspection of installed components.
    c. Requirements and recommendations related to results of maintenance.
    d. Manufacturer's user training manuals.

5. Manufacturer's required maintenance related to system warranty requirements.
6. Abbreviated operating instructions for mounting at fire-alarm control unit.
7. Copy of NFPA 25.

I. Software and Firmware Operational Documentation:

1. Software operating and upgrade manuals.
2. Program Software Backup: On magnetic media or compact disk, complete with data files.
3. Device address list.
4. Printout of software application and graphic screens.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: Personnel shall be trained and certified by manufacturer for installation of units required for this Project.

B. Installer Qualifications: Installation shall be by personnel certified by NICET as fire-alarm **Level III** technician.

C. Source Limitations for Fire-Alarm System and Components: Obtain fire-alarm system from single source from single manufacturer. Components shall be compatible with, and operate as, an extension of existing system.

D. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

1.6 SOFTWARE SERVICE AGREEMENT

A. Comply with UL 864.

B. Technical Support: Beginning with Substantial Completion, provide software support for **two** years.

C. Upgrade Service: Update software to latest version at Project completion. Install and program software upgrades that become available within **two** years from date of Substantial Completion. Upgrading software shall include operating system. Upgrade shall include new or revised licenses for use of software.

1. Provide **30** days' notice to Owner to allow scheduling and access to system and to allow Owner to upgrade computer equipment if necessary.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

B. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:

1. Amseco - a Potter brand; Potter Electric Signal Company.
2. Bosch Security Systems.
3. Commercial Products Group/CPG Life Safety Signals.
4. Faraday; Siemens Building Technologies, Inc.
5. Federal Signal Corporation.
6. Fire Control Instruments, Inc.; a Honeywell company.
7. Fire Lite Alarms; a Honeywell company.
8. Gamewell; a Honeywell company.
9. GE Infrastructure; a unit of General Electric Company.
10. Gentex Corporation.
11. Harrington Signal, Inc.
12. NOTIFIER; a Honeywell company.
13. Siemens Building Technologies, Inc.; Fire Safety Division.
14. Silent Knight; a Honeywell company.
15. SimplexGrinnell LP; a Tyco International company.

2.2 SYSTEMS OPERATIONAL DESCRIPTION

A. Fire-alarm signal initiation shall be by one or more of the following devices and systems:

1. Manual stations.

2. Heat detectors.
3. Smoke detectors.
4. Duct smoke detectors.
5. Automatic sprinkler system water flow.
6. Heat detectors in elevator shaft and pit.
7. Fire-extinguishing system operation.
8. Fire standpipe system.

B. Fire-alarm signal shall initiate the following actions:

1. Continuously operate alarm-notification appliances.
2. Identify alarm at the fire-alarm control unit and remote annunciators.
3. Transmit an alarm signal to the remote alarm receiving station.
4. Unlock electric door locks in designated egress paths.
5. Release fire and smoke doors held open by magnetic door holders.
6. Switch heating, ventilating, and air-conditioning equipment controls to fire-alarm mode.
7. Recall elevators to primary or alternate recall floors.
8. Activate emergency lighting control.
9. Activate emergency shutoffs for gas and fuel supplies.
10. Record events in the system memory.

C. Supervisory signal initiation shall be by one or more of the following devices and actions:

1. Valve supervisory switch.
2. Low-air-pressure switch of a dry-pipe sprinkler system.

D. System trouble signal initiation shall be by one or more of the following devices and actions:

1. Open circuits, shorts, and grounds in designated circuits.
2. Opening, tampering with, or removing alarm-initiating and supervisory signal-initiating devices.
3. Loss of primary power at fire-alarm control unit.
4. Ground or a single break in fire-alarm control unit internal circuits.
5. Abnormal ac voltage at fire-alarm control unit.
6. Break in standby battery circuitry.
7. Failure of battery charging.
8. Abnormal position of any switch at fire-alarm control unit or annunciator.
9. Fire-pump power failure, including a dead-phase or phase-reversal condition.
10. Low-air-pressure switch operation on a dry-pipe or preaction sprinkler system.

E. System Trouble and Supervisory Signal Actions: Initiate notification appliance and annunciate at fire-alarm control unit and remote annunciators.

2.3 FIRE-ALARM CONTROL UNIT

A. General Requirements for Fire-Alarm Control Unit:

1. Field-programmable, microprocessor-based, modular, power-limited design with electronic modules, complying with UL 864 and listed and labeled by an NRTL.

    a. System software and programs shall be held in flash electrically erasable programmable read-only memory (EEPROM), retaining the information through failure of primary and secondary power supplies.
    b. Include a real-time clock for time annotation of events on the event recorder and printer.

2. Addressable control circuits for operation of mechanical equipment.

B. Alphanumeric Display and System Controls: Arranged for interface between human operator at fire-alarm control unit and addressable system components including annunciation and supervision. Display alarm, supervisory, and component status messages and the programming and control menu.

1. Annunciator and Display: Liquid-crystal type, [**1**] [**2**] [**3**] line(s) of [**40**] [**80**] characters, minimum.
2. Keypad: Arranged to permit entry and execution of programming, display, and control commands and to indicate control commands to be entered into the system for control of smoke-detector sensitivity and other parameters.

C. Circuits:

1. Initiating Device, Notification Appliance, and Signaling Line Circuits: NFPA 72, Class A.
    a. Install no more than 50 addressable devices on each signaling line circuit.

2. Initiating Device, Notification Appliance, and Signaling Line Circuits: NFPA 72, Class B.
    a. Install no more than 50 addressable devices on each signaling line circuit.

D. Notification Appliance Circuit: Operation shall sound in compliance with NFPA 72.

2.4 MANUAL FIRE-ALARM BOXES

A. General Requirements for Manual Fire-Alarm Boxes: Comply with UL 38. Boxes shall be finished in red with molded, raised-letter operating instructions in contrasting color; shall show visible indication of operation; and shall be mounted on recessed outlet box. If indicated as surface mounted, provide manufacturer's surface back box.

1. Single-action mechanism, pull-lever type. With integral addressable module arranged to communicate manual-station status (normal, alarm, or trouble) to fire-alarm control unit.
2. Double-action mechanism requiring two actions to initiate an alarm, pull-lever type; with integral addressable module arranged to communicate manual-station status (normal, alarm, or trouble) to fire-alarm control unit.
3. Station Reset: Key- or wrench-operated switch.
4. Indoor Protective Shield: Factory-fabricated clear plastic enclosure hinged at the top to permit lifting for access to initiate an alarm. Lifting the cover actuates an integral battery-powered audible horn intended to discourage false-alarm operation.
5. Weatherproof Protective Shield: Factory-fabricated clear plastic enclosure hinged at the top to permit lifting for access to initiate an alarm.

2.5 SYSTEM SMOKE DETECTORS

A. General Requirements for System Smoke Detectors:

1. Comply with UL 268; operating at 24-V dc, nominal.
2. Detectors shall be four-wire type.
3. Integral Addressable Module: Arranged to communicate detector status (normal, alarm, or trouble) to fire-alarm control unit.
4. Base Mounting: Detector and associated electronic components shall be mounted in a twist-lock module that connects to a fixed base. Provide terminals in the fixed base for connection to building wiring.
5. Self-Restoring: Detectors do not require resetting or readjustment after actuation to restore them to normal operation.
6. Integral Visual-Indicating Light: LED type indicating detector has operated and power-on status.

B. Photoelectric Smoke Detectors:

1. Detector address shall be accessible from fire-alarm control unit and shall be able to identify the detector's location within the system and its sensitivity setting.
2. An operator at fire-alarm control unit, having the designated access level, shall be able to manually access the following for each detector:

    a. Primary status.
    b. Device type.
    c. Present average value.
    d. Present sensitivity selected.
    e. Sensor range (normal, dirty, etc.).

C. Duct Smoke Detectors: Photoelectric type complying with UL 268A.

1. Detector address shall be accessible from fire-alarm control unit and shall be able to identify the detector's location within the system and its sensitivity setting.
2. An operator at fire-alarm control unit, having the designated access level, shall be able to manually access the following for each detector:

    a. Primary status.
    b. Device type.
    c. Present average value.
    d. Present sensitivity selected.
    e. Sensor range (normal, dirty, etc.).

3. Weatherproof Duct Housing Enclosure: NEMA 250, Type 4X; NRTL listed for use with the supplied detector.
4. Each sensor shall have multiple levels of detection sensitivity.
5. Sampling Tubes: Design and dimensions as recommended by manufacturer for specific duct size, air velocity, and installation conditions where applied.
6. Relay Fan Shutdown: Rated to interrupt fan motor-control circuit.

2.6 NONSYSTEM SMOKE DETECTORS

A. Single-Station Smoke Detectors:

1. Comply with UL 217; suitable for NFPA 101, residential occupancies; operating at 120-V ac with 9-V dc battery as the secondary power source. Provide with "low" or "missing" battery chirping-sound device.
2. Auxiliary Relays: One Form A, and one Form C, both rated at 0.5 A.
3. Audible Notification Appliance: Piezoelectric sounder rated at 90 dBA at 10 feet according to UL 464.
4. Visible Notification Appliance: 177-cd strobe.
5. Heat sensor, 135 deg F combination rate-of-rise and fixed temperature.
6. Test Switch: Push to test; simulates smoke at rated obscuration.
7. Tandem Connection: Allow tandem connection of number of indicated detectors; alarm on one detector shall actuate notification on all connected detectors.
8. Plug-in Arrangement: Detector and associated electronic components shall be mounted in a plug-in module that connects to a fixed base. Provide terminals in the fixed base for connection to building wiring.
9. Self-Restoring: Detectors shall not require resetting or readjustment after actuation to restore them to normal operation.
10. Integral Visual-Indicating Light: LED type indicating detector has operated and power-on status.

B. Single-Station Duct Smoke Detectors:

1. Comply with UL 268A; operating at 120-V ac.
2. Sensor: LED or infrared light source with matching silicon-cell receiver.

a. Detector Sensitivity: Smoke obscuration between 2.5 and 3.5 percent/foot when tested according to UL 268A.

3. Base Mounting: Detector and associated electronic components shall be mounted in a twist-lock module that connects to a fixed base. The fixed base shall be designed for mounting directly to air duct. Provide terminals in the fixed base for connection to building wiring.

a. Weatherproof Duct Housing Enclosure: NEMA 250, Type 4X; NRTL listed for use with the supplied detector.

4. Sampling Tubes: Design and dimensions as recommended by manufacturer for specific duct size, air velocity, and installation conditions where applied.
5. Relay Fan Shutdown: Rated to interrupt fan motor-control circuit.

2.7 HEAT DETECTORS

A. General Requirements for Heat Detectors: Comply with UL 521.

B. Heat Detector, Combination Type: Actuated by either a fixed temperature of 135 deg F or a rate of rise that exceeds 15 deg F per minute unless otherwise indicated.

1. Mounting: Adapter plate for outlet box mounting or Twist-lock base interchangeable with smoke-detector bases.
2. Integral Addressable Module: Arranged to communicate detector status (normal, alarm, or trouble) to fire-alarm control unit.

C. Heat Detector, Fixed-Temperature Type: Actuated by temperature that exceeds a fixed temperature of 190 deg F.

1. Mounting: Adapter plate for outlet box mounting or Twist-lock base interchangeable with smoke-detector bases.
2. Integral Addressable Module: Arranged to communicate detector status (normal, alarm, or trouble) to fire-alarm control unit.

2.8 NOTIFICATION APPLIANCES

A. General Requirements for Notification Appliances: Connected to notification appliance signal circuits, zoned as indicated, equipped for mounting as indicated and with screw terminals for system connections.

1. Combination Devices: Factory-integrated audible and visible devices in a single-mounting assembly, equipped for mounting as indicated and with screw terminals for system connections.

B. Chimes, Low-Level Output: Vibrating type, 75-dBA minimum rated output.

C. Chimes, High-Level Output: Vibrating type, 81-dBA minimum rated output.

D. Horns: Electric-vibrating-polarized type, 24-V dc; with provision for housing the operating mechanism behind a grille. Comply with UL 464. Horns shall produce a sound-pressure level of 90 dBA, measured 10 feet from the horn, using the coded signal prescribed in UL 464 test protocol.

E. Visible Notification Appliances: Xenon strobe lights comply with UL 1971, with clear or nominal white polycarbonate lens mounted on an aluminum faceplate. The word "FIRE" is engraved in minimum 1-inch-high letters on the lens.

1. Rated Light Output:

a. 110/177 cd.
b. 15/30/75/110 cd, selectable in the field.

2. Mounting: Wall mounted unless otherwise indicated.
3. For units with guards to prevent physical damage, light output ratings shall be determined with guards in place.
4. Flashing shall be in a temporal pattern, synchronized with other units.
5. Strobe Leads: Factory connected to screw terminals.
6. Mounting Faceplate: Factory finished, red or white.

2.9 MAGNETIC DOOR HOLDERS

A. Description: Units are equipped for wall or floor mounting as indicated and are complete with matching doorplate.

1. Electromagnet: Requires no more than 3 W to develop 25-lbf holding force.
2. Wall-Mounted Units: Flush mounted unless otherwise indicated.
3. Rating: 24-V ac or dc.
4. Rating: 120-V ac.

B. Material and Finish: Match door hardware.

2.10 REMOTE ANNUNCIATOR

A. Description: Annunciator functions shall match those of fire-alarm control unit for alarm, supervisory, and trouble indications. Manual switching functions shall match those of fire-alarm control unit, including acknowledging, silencing, resetting, and testing.

1. Mounting: Flush or Surface cabinet, NEMA 250, Type 1.

B. Display Type and Functional Performance: Alphanumeric display and LED indicating lights shall match those of fire-alarm control unit. Provide controls to acknowledge, silence, reset, and test functions for alarm, supervisory, and trouble signals.

2.11 ADDRESSABLE INTERFACE DEVICE

A. Description: Microelectronic monitor module, NRTL listed for use in providing a system address for alarm-initiating devices for wired applications with normally open contacts.

B. Integral Relay: Capable of providing a direct signal to circuit-breaker shunt trip for power shutdown.

2.12 DIGITAL ALARM COMMUNICATOR TRANSMITTER

A. Digital alarm communicator transmitter shall be acceptable to the remote central station and shall comply with UL 632 and be listed and labeled by an NRTL.

B. Functional Performance: Unit shall receive an alarm, supervisory, or trouble signal from fire-alarm control unit and automatically capture telephone line(s) and dial a preset number for a remote central station. When contact is made with central station(s), signals shall be transmitted. If service on line is interrupted for longer than 45 seconds, transmitter shall initiate a local trouble signal and transmit the signal indicating loss of telephone line to the remote alarm receiving station over the remaining line. Transmitter shall automatically report telephone service restoration to the central station. If service is lost on both telephone lines, transmitter shall initiate the local trouble signal.

C. Local functions and display at the digital alarm communicator transmitter shall include the following:

1. Verification that both telephone lines are available.
2. Programming device.
3. LED display.
4. Manual test report function and manual transmission clear indication.
5. Communications failure with the central station or fire-alarm control unit.

D. Digital data transmission shall include the following:

1. Address of the alarm-initiating device.
2. Address or Zone of the supervisory signal.
3. Address or Zone of the trouble-initiating device.
4. Loss of ac supply or loss of power.
5. Low battery.
6. Abnormal test signal.

7. Communication bus failure.

E. Secondary Power: Integral rechargeable battery and automatic charger.

F. Self-Test: Conducted automatically every 24 hours with report transmitted to central station.

PART 3 - EXECUTION

3.1 EQUIPMENT INSTALLATION

A. Comply with NFPA 72 for installation of fire-alarm equipment.

B. Equipment Mounting: Install fire-alarm control unit on concrete base with tops of cabinets not more than 72 inches above the finished floor. Comply with requirements for concrete base specified in Division 03.

1. Install seismic bracing. Comply with requirements in Division 26 Section "Vibration and Seismic Controls for Electrical Systems."
2. Install dowel rods to connect concrete base to concrete floor. Unless otherwise indicated, install dowel rods on 18-inch centers around the full perimeter of concrete base.
3. For supported equipment, install epoxy-coated anchor bolts that extend through concrete base and anchor into structural concrete floor.
4. Place and secure anchorage devices. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
5. Install anchor bolts to elevations required for proper attachment to supported equipment.

C. Equipment Mounting: Install fire-alarm control unit on finished floor with tops of cabinets not more than 72 inches above the finished floor.

1. Comply with requirements for seismic-restraint devices specified in Division 26 Section "Vibration and Seismic Controls for Electrical Systems."
2. Comply with requirements for seismic-restraint devices specified in Division 26 Section "Vibration and Seismic Controls for Electrical Systems."

D. Connecting to Existing Equipment: Verify that existing fire-alarm system is operational before making changes or connections.

1. Connect new equipment to existing control panel in existing part of the building.
2. Connect new equipment to existing monitoring equipment at the supervising station.

E. Smoke- or Heat-Detector Spacing:

1. Comply with NFPA 72, "Smoke-Sensing Fire Detectors" Section in the "Initiating Devices" Chapter, for smoke-detector spacing.
2. Comply with NFPA 72, "Heat-Sensing Fire Detectors" Section in the "Initiating Devices" Chapter, for heat-detector spacing.
3. Smooth ceiling spacing shall not exceed 30 feet.
4. Spacing of detectors for irregular areas, for irregular ceiling construction, and for high ceiling areas shall be determined according to Appendix A or Appendix B in NFPA 72.
5. HVAC: Locate detectors not closer than 3 feet from air-supply diffuser or return-air opening.
6. Lighting Fixtures: Locate detectors not closer than 12 inches from any part of a lighting fixture.

F. Duct Smoke Detectors: Comply with NFPA 72 and NFPA 90A. Install sampling tubes so they extend the full width of duct.

G. Heat Detectors in Elevator Shafts: Coordinate temperature rating and location with sprinkler rating and location.

H. Single-Station Smoke Detectors: Where more than one smoke alarm is installed within a dwelling or suite, they shall be connected so that the operation of any smoke alarm causes the alarm in all smoke alarms to sound.

I. Remote Status and Alarm Indicators: Install near each smoke detector and each sprinkler water-flow switch and valve-tamper switch that is not readily visible from normal viewing position.

J. Audible Alarm-Indicating Devices: Install not less than 6 inches below the ceiling. Install bells and horns on flush-mounted back boxes with the device-operating mechanism concealed behind a grille.

K. Visible Alarm-Indicating Devices: Install adjacent to each alarm bell or alarm horn and at least 6 inches below the ceiling.

L. Device Location-Indicating Lights: Locate in public space near the device they monitor.

M. Fire-Alarm Control Unit: Surface mounted, with tops of cabinets not more than 72 inches above the finished floor.

N. Annunciator: Install with top of panel not more than 72 inches above the finished floor.

3.2 CONNECTIONS

A. For fire-protection systems related to doors in fire-rated walls and partitions and to doors in smoke partitions, comply with requirements in Division 08 Section "Door Hardware." Connect hardware and devices to fire-alarm system.

1. Verify that hardware and devices are NRTL listed for use with fire-alarm system in this Section before making connections.

B. Make addressable connections with a supervised interface device to the following devices and systems. Install the interface device less than 3 feet from the device controlled. Make an addressable confirmation connection when such feedback is available at the device or system being controlled.

1. Alarm-initiating connection to smoke-control system (smoke management) at firefighter smoke-control system panel.
2. Alarm-initiating connection to elevator recall system and components.
3. Alarm-initiating connection to activate emergency lighting control.
4. Alarm-initiating connection to activate emergency shutoffs for gas and fuel supplies.
5. Supervisory connections at valve supervisory switches.
6. Supervisory connections at low-air-pressure switch of each dry-pipe sprinkler system.
7. Supervisory connections at elevator shunt trip breaker.
8. Supervisory connections at fire-pump power failure including a dead-phase or phase-reversal condition.
9. Supervisory connections at fire-pump engine control panel.

3.3 IDENTIFICATION

A. Identify system components, wiring, cabling, and terminals. Comply with requirements for identification specified in Division 26 Section "Identification for Electrical Systems."

B. Install framed instructions in a location visible from fire-alarm control unit.

3.4 GROUNDING

A. Ground fire-alarm control unit and associated circuits; comply with IEEE 1100. Install a ground wire from main service ground to fire-alarm control unit.

3.5 FIELD QUALITY CONTROL

A. Field tests shall be witnessed by authorities having jurisdiction.

B. Tests and Inspections:

1. Visual Inspection: Conduct visual inspection prior to testing.

    a. Inspection shall be based on completed Record Drawings and system documentation that is required by NFPA 72 in its "Completion Documents, Preparation" Table in the "Documentation" Section of the "Fundamentals of Fire Alarm Systems" Chapter.
    b. Comply with "Visual Inspection Frequencies" Table in the "Inspection" Section of the "Inspection, Testing and Maintenance" Chapter in NFPA 72; retain the "Initial/Reacceptance" column and list only the installed components.

2. System Testing: Comply with "Test Methods" Table in the "Testing" Section of the "Inspection, Testing and Maintenance" Chapter in NFPA 72.
3. Test audible appliances for the public operating mode according to manufacturer's written instructions. Perform the test using a portable sound-level meter complying with Type 2 requirements in ANSI S1.4.
4. Test audible appliances for the private operating mode according to manufacturer's written instructions.
5. Test visible appliances for the public operating mode according to manufacturer's written instructions.
6. Factory-authorized service representative shall prepare the "Fire Alarm System Record of Completion" in the "Documentation" Section of the "Fundamentals of Fire Alarm Systems" Chapter in NFPA 72 and the "Inspection and Testing Form" in the "Records" Section of the "Inspection, Testing and Maintenance" Chapter in NFPA 72.

C. Reacceptance Testing: Perform reacceptance testing to verify the proper operation of added or replaced devices and appliances.

D. Fire-alarm system will be considered defective if it does not pass tests and inspections.

E. Prepare test and inspection reports.

F. Maintenance Test and Inspection: Perform tests and inspections listed for weekly, monthly, quarterly, and semiannual periods. Use forms developed for initial tests and inspections.

G. Annual Test and Inspection: One year after date of Substantial Completion, test fire-alarm system complying with visual and testing inspection requirements in NFPA 72. Use forms developed for initial tests and inspections.

END OF SECTION 283111

(PAGE INTENTIONALLY LEFT BLANK)